THE OIL AND GAS JOURNAL

DECEMBER 23, 1957

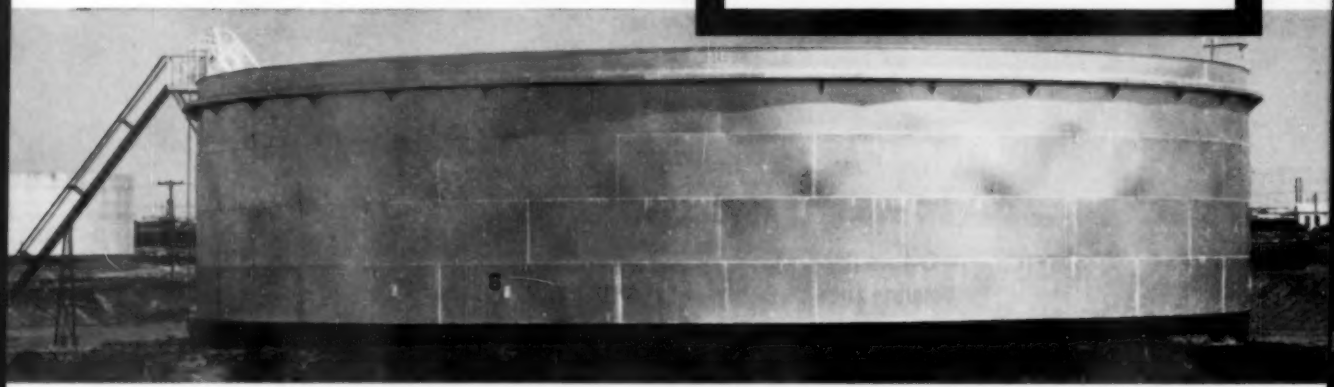
SEASON'S GREETINGS

C. Dudley Johnston

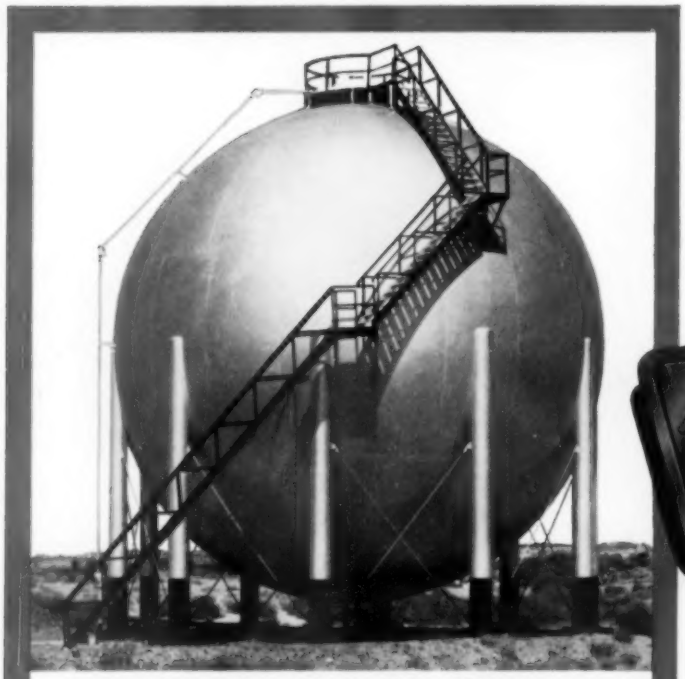
IN WYATT'S BOOK
ON STORAGE

THE OLD
and
THE NEW
add up to
THE MODERN

NEW for PRODUCTS STORAGE: 30,000-barrel tank with Wyatt's Pontoon Type Floating Roof.



CONE ROOF to FLOATING ROOF: After repairs to bottom and shell and addition of a top ring with wind girder, this 55,000-barrel riveted tank was restored to sour crude service — its capacity increased to 58,600 barrels. Wyatt's Pontoon Type Floating Roof reduces Evaporation and Corrosion and prevents Fire.



NEW for LPG SERVICE: This 10,000-barrel Sphere was designed for 15 PSI.

Examples of Wyatt's Practice in keeping storage modern for an expanding refining company.

Wyatt's Plastics, Inc.
Plastics and rubber products for the processing industries.

MANUFACTURERS AND ERECTORS SINCE 1913

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 23, 1957

Oil men are keeping one eye cocked on crude-oil prices.

Scattered price cuts are making them anxious.

But most industry leaders think prices will stick. And nearly all of them, except independent refiners maybe, hope they will.

This was the picture at weekend:

...Illinois basin is operating with a two-price structure.

The 15-cent cut posted by Sohio Petroleum has spread to more than half the basin's production. Several important buyers, however, still have not joined the cut.

...Four Corners also has twin postings.

Union Oil posted a $2.90 price. This is 25 cents under the $3.15 earlier posting of California Standard and Shell. Prices in this region probably won't stabilize until after pipelines being built from the area are in operation.

...South Texas is suffering a price shock.

Southern Minerals cut posted price 10 cents for lower Gulf and Southwest Texas. The reduction reflects a soft local market and is called an adjustment to meet postings already in effect. Small amount of oil is involved.

Optimistic view is taken by most industry observers.

They say: The cuts have local significance only, at this time anyway. Cold weather is beginning to make itself felt on fuel-oil stocks. Stocks of crude and products appear to be holding stable. State conservation authorities have been doing good job of keeping production in line. All these tend to firm the price structure.

Two developments are worth noting:

New idea for separating oil from the Athabasca sands comes from a Canadian researcher.

His approach: Highly pitched sound waves shot into the sands will jar the oil loose. Tests are under way to design equipment for large-scale separation work.

A new corrosion caliper for oil-well tubing has been introduced by M. M. Kinley Co. of Houston. It has 15 feelers, each with an independent stylus to record its trace.

Kinley claims the new tool will show up individual pits as well as ring and line corrosion.

Oil securities lure investors the world over.

French Government offered small investors a chance to buy nonvoting shares in state-controlled oil companies some weeks ago. The man in the street, fired by French successes in the Sahara, nearly mobbed banks and brokerage houses trying to buy the stock.

British Petroleum Co. in London last week offered the public $114,800,000 in convertible debentures.

Stockholders of BP, Burmah Oil Co., and many interested in neither company wanted to buy almost $2-billion worth of the securities—more than 15 times the amount offered.

Now BP's allotment committee must decide who gets how much. One interesting note: The British Government didn't participate. If all the debentures are converted to common in 1958 and 1959, government's share of BP will be shaved from 55 to 51 per cent.

Argentina repeated the whole process 2 days later.

Yacimientos Petroliferos Fiscales, government oil agency, wanted to shore up its sagging oil fortunes without letting in foreign capital.

YPF offered Argentine investors $14 million in bonds. They were sold out in 3 hours. YPF promptly released a second issue of the same amount to cash in on the mood.

One big U. S. major is cultivating the investing public.

Socony Mobil has started a school for security analysts. Idea is to orient the investment experts in operations of the oil industry and Socony in particular.

Reasoning behind the school: Oil companies in the future will have to tap venture capital to finance vast expansion programs. Profits no longer will do the whole job. So the growth of a company may depend on what the investing public thinks of it.

Expect Brazil to start pilot water-flood studies soon.

Three U. S. petroleum engineers are scheduled to go to Brazil soon to inaugurate the work. Studies will be undertaken in some of the nation's promising oil reservoirs in the Bahia producing district.

Brazil's Bahia production, incidentally, has jumped remarkably this year. It has risen from less than 10,000 bbl. daily to as high as 39,000. The reason: New drilling.

New feuding has erupted in efforts to repressure subsiding Wilmington field in Long Beach, Calif.

Immediate contention is over a 180,000 bbl. daily flood the Long Beach Oil Development Co., with backing of the Board of Harbor Commissioners, wants to start on south flank of field. Flood is recommended by prominent consulting engineer.

The Long Beach city council, also backed by a leading

engineering firm, twice before has rejected plan, and is expected to do so again. City believes it wouldn't have sufficient control over flood and the small project might not fit into the much larger injection program planned.

Gas producers in the Southwest and Gulf Coast are showing more interest in entering pipelining.

The incentive: Avoid price controls.

Gas men explain it this way: A producer can line up a big industrial customer and sell its gas at any price the two agree upon. Since the gas is not sold to an interstate pipeline for resale, it escapes FPC control.

Job then is to get the gas moved from field direct to customer. Trick has been to find a pipeline which will move the gas for a freight fee.

This type of marketing got boost from recent Memphis decision. That court ruling making prior customer approval mandatory for gas-rate increases chilled producers from selling more gas to interstate lines.

Result has been renewed efforts to find private customers. Several such deals reportedly will involve building a pipeline from field to customer.

Big natural-gas pipelines, meanwhile, are feeling a pinch from the Memphis decision.

Construction projects scheduled for 1958 totaling hundreds of millions have been suspended. The reason is inability to finance them following confusion created by the U. S. Circuit Court ruling.

Double allowables may not stick in New Mexico. State has different allowables for Four Corners than rest of state.

Officials expect to take another look at this policy when Texas-New Mexico pipeline is completed. The line will bring oil from Four Corners east. Then it will compete with southeastern New Mexico crude. Most of Four Corners crude now moves in the other direction.

Deep-drilling trend in North Dakota has a real boost.

Amerada has four straight successes this month in Beaver Lodge field, all below 11,000 ft. Previous production in the field was from around 8,200 ft.

The new Silurian and Devonian discoveries are part of deep-play era in Williston basin exploration. It was set off earlier this year by Outlook success in northeastern Montana.

Tennessee Gas is studying plans to extend its offshore system in the Gulf of Mexico.

The 12-in. line may be shoved 10 miles farther from shore in West Delta area off the mouth of the Mississippi. This would make it terminate at CATC Group's Block 59 field.

Tough battle is facing Westcoast Transmission's attempt to get export permit for Alberta gas.

Westcoast wants to build its own line from Savanna Creek field to Coleman processing plant. El Paso Natural and Pacific Northwest would move this gas to California.

But Alberta & Southern, affiliate of Pacific Gas & Electric, wants to build a line to San Francisco. It raises monopoly charge against El Paso-Pacific Northwest plans.

More complication comes from Alberta Gas Trunk Line, a provincial company. It insists on its right to control gas transport in Alberta. Alberta Gas Trunk Line maintains if both projects are authorized, it should be allowed to build integrated lines to serve both systems. This would avoid duplication of facilities.

New refinery is being talked for the fabulous strip of Mississippi River front from Baton Rouge to New Orleans.

Project is attributed to Lion Oil Co., a division of Monsanto Chemical. Lion already has perfect site adjacent to its existing ammonia plant 20 miles upriver from New Orleans. Crude is easily available. River is ideal for transport.

If Lion does build: It will emphasize the attraction of the Baton Rouge-New Orleans strip for processors. More than $290 million in new construction has been put in there within last 3 years. More is in the books.

World's northernmost refinery is now in operation.

And the Finns have lost no time in running their Neste Oy plant at up to 115 per cent of design capacity. Location is at Naantali, Finland, near port of Turku.

Feed stock is mixture of Middle East and Russian crudes. The 18,500-bbl. daily Neste Oy plant has a fully electronic instrument control system. Processing includes a 3,400-bbl. Atlantic cat reformer, 6,000-bbl. thermal cat cracking and 500-bbl. poly unit.

A new 8,000-bbl. refinery has been put on stream east of Gallup, N. M., by El Paso Natural Gas Products.

Products from the $10-million plant will be marketed in the Four Corners region, will spread later over Texas and more of Arizona.

Independent refiners are moving further into marketing.

A rash of new brand names on service-station pumps is resulting.

The trend has an explanation: Major companies are buying less from independent refiners. The refined-product market has been sloppy. Soft prices are making it tough on refiners generally.

This has made the independents move to carve out their own retail outlets.

Good Wells Make Good News

December 23, 1957

ACIDIZING has long been a good way to stimulate production from zones of high solubility. With Dowell-proved addition agents, acid is giving faster payouts in more fields than ever before. Here are some recent examples of successful Dowell acid treatments.

- **Meade County, Kansas** (New Gas Well): This well was completed in the Mississippi lime (90-95 per cent soluble) at 6470 to 6494 feet. Before treatment, it tested 3.5 mmcfd open flow. *After treatment with 10,000 gallons of Retarded Acid, injected down casing at 28.5 bpm, well tested 30 mmcfd open flow.*

- **Alberta, Canada** (Old Well): This oil well was completed through two sets of perforations in the Elkton member of the Mississippian lime at about 9100 feet. Production had declined to the point where the well would flow only one or two days—then die for three or four. Dowell recommended a combination acid treatment designed to get deep penetration, using 5000 gallons of Retarded Acid ahead of 15,000 gallons of the acid-oil emulsion used in Acid Petrofrac®. The treatment was performed down casing to reduce treating pressure. Average injection rate was 6 bpm at 3300 psi. *After treatment the well tested 440 bopd flowing on three consecutive tests.*

- **Crawford County, Illinois** (New Oil Well): Completed in Aux Vases sandy lime, 1514 to 1532 feet open hole. Initial production 50 bopd. Acid Petrofrac was selected as the treatment. A 500-gallon spearhead of regular Dowell inhibited acid with surface tension reducing agents, preceded 3000 gallons of acid-oil emulsion with 3000 pounds of sand down 4½-inch casing, 12 bpm at 1400 psi. *After treatment, well was put on pump at 140 bopd—much better production than other wells in the area.*

- **Lea County, New Mexico** (New Well): This oil well would not flow when completed in the flashy Kemnitz Wolfcamp lime at 10,600 feet. Treatments performed on other wells in this field indicated regular acid would not give desired results because of the fast reaction rate of the acid with the formation. Dowell engineers recommended a combination treatment using 1000 gallons of Mud Acid, 3000 gallons of Retarded Acid and finally 15,000 gallons of the acid-oil emulsion used in Acid Petrofrac®. Since each acid has a different reaction time, this treatment was designed to extend the drainage area of the well by getting deep penetration. *After treatment the well tested 275 bopd flowing.*

Whether your well responds best to regular acid, thickened acid or an acid-oil emulsion your Dowell Engineer can tailor a treatment to the requirements of your well. For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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The OIL AND GAS JOURNAL

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IN THE NEWS

General Interest:

Industry Thinks Crude Prices Will Remain Firm ... 27
FPC Argues Against Kansas Plan for Setting Gas Prices ... 28
Socony Mobil Educates Security Analysts on Oil ... 29
Tri-State Crude Costs More Than It Brings, Carter Says ... 30
Lengthy Phillips Gas Case Ready for Examiner's Study ... 31
Imports Held Below Recommended Level for Second Month ... 32
LPG Sales Set New Record, Will Rise Again in '58 ... 42
OCAW Calls Meeting to Study Shorter Week ... 50

Pipelining:

British Build Link in Line to Use Imported Methane ... 33
Texas Will Settle Producer-Pipeline Argument Soon ... 39
Pipeline Briefs ... 43
El Paso Signs Up Big Aneth Gas Reserves ... 45

Exploration:

Amerada Gets Four Deep Wildcats at Beaver Lodge ... 36
Persian Gulf Offshore Drilling May Rival Land Fields ... 51
Egypt Will Explore Home Areas With Russian Money ... 53
U. S. Syndicate Spuds Wildcat in Turkish Concession ... 54
Canadian Strikes Packed a Wallop in 1957 ... 107
Exploration Picture Is Bright for Geophysicists ... 108
Good Year-End Strikes Made in Four Oklahoma Sectors ... 110

Production and Drilling:

California Rigs Fail to Get Acceptable Bids at Auction ... 31
Kinley Unveils New Corrosion Caliper for Tubing ... 34
Sound Waves May Separate Oil from Athabasca Sands ... 35
Major Water Flood Planned for North Texas KMA Field ... 36
Skelly Plans Huge Gas Drive at Velma ... 40
Long Beach Subsidence Brings Sharp Disagreements ... 40
Northwest New Mexico Production May Be Slashed ... 48
Gulf Allowable Case Is Heard by Oklahoma Commission ... 48

Processing:

Du Pont Claim Confuses Polyethylene Patent Rights ... 42
Small Refiners Are Entering Marketing Field in South ... 46
Processing Briefs ... 47
El Paso Completes Refinery Near Gallup, N. M. ... 50
Finland Is Proud of Its New Refinery at Naantali ... 53
New Refinery Is Opened by Russia at Stalingrad ... 54
Italy Must Decide Soon Whether to Take Over Shell Plant ... 54

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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TECHNOLOGY–OPERATION

Drilling-Production

Electromagnetic Devices in Drilling 55

E. A. Studer

Several recent applications of eddy-current electromagnetic devices extend the usefulness of these proved drilling devices. The magnetic-particle brake incorporates some more recently discovered principles of power transmission.

Figuring Net Pay in Carbonate Reservoirs 64

R. E. Stewart

A combination of three logging methods has proved to be quite successful for the determination of net pay in carbonate reservoirs. These are the gamma ray-neutron, guard, and guard-contact logs. It is now possible to predict what saturation and porosity will be necessary for a given rock type to produce commercially.

U. S. Drilling Pattern Changes 81

Perhaps the biggest factor in bringing about this change is fracturing. With this tool it is profitable to reevaluate old oil fields where drilling risks are low, leases cheap, and there is an abundance of subsurface information. At lease 50 per cent of all field drilling is taking place in old fields.

On The Job . . . In The Fields 83

Here's how to make cuts with a torch—Trailer speeds well tests—A quick way to connect guy wires—I-Beam forms base for pipe stands—Skid frames for moving water tanks.

Refining-Processing

Catalyst Erosion in Cat Crackers—2 61

Larry Resen

Part 2 of a four-part series devoted to case histories of erosion problems and their control in fluid catalytic cracking units. This installment is devoted to the catalyst carrier line, the flue-gas stack and lines, and the aeration system.

Cost Projector Slide Rule Speeds Estimates 69

This new rule facilitates the production of a cost estimate and shortens the time spent in reference work. The scales of the circular rule are a plot of the Journal's Nelson Cost Index. The various components of it and some of the most useful of the detailed indexes go to make it up.

Making Butadiene—5: Feed Preparation and Finishing 74

John C. Reidel

Here are the pertinent points on the use of furfural extractive distillation when btuylene is feed stock and when butane is the feed. Ultraviolet and infrared analyzers and controllers are utilized in the furfural systems. The last of a five-part series.

Refinery Construction Report 85

Questions On Technology 86

Pipelining

Performance of a New 890-960 Mc. Communication System 70

M. L. Hall

These frequencies and RF equipment possess features which are highly desirable for certain applications. Among these are: noncritical tower requirements, antenna alignment, excellent propagation reliability, and simplicity of maintenance.

Pipeline Construction Report 91

DEPARTMENTS

They Say	15	Refinery Construction Report	85	Personals	120
Calendar of Events	18	Questions on Technology	86	Statistical Summary	123
Journally Speaking	23	Pipeline Construction Report	91	Drilling Statistics	124
Editorial	25	Drilling Contractors	97	Supply Statistics	125
Watching Washington	33	New Equipment	99	Refining Statistics	126
International News	51	Trade Literature	102	Markets	127
Books	68	Equipment Men in News	103	Classified Advertising	128
On the Job . . . In the Fields	83	Exploration Highlights	107	Advertisers' Index	131

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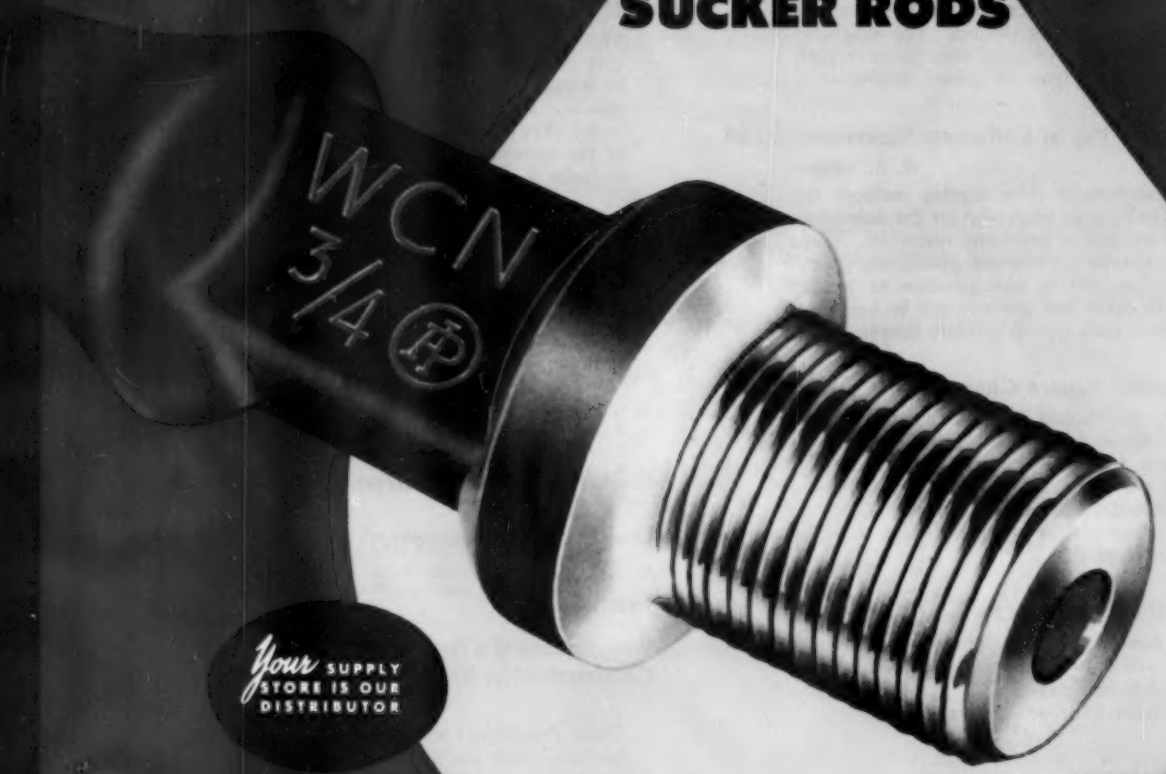

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Oil Well Supply store in Williston, N.D.; Clair D. Haas, Manager.

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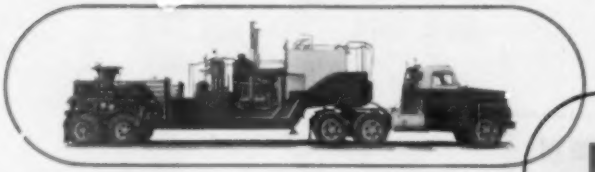

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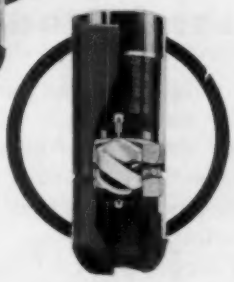
Turbo-Jet Float Shoe



Turbo-Jet Guide Shoe

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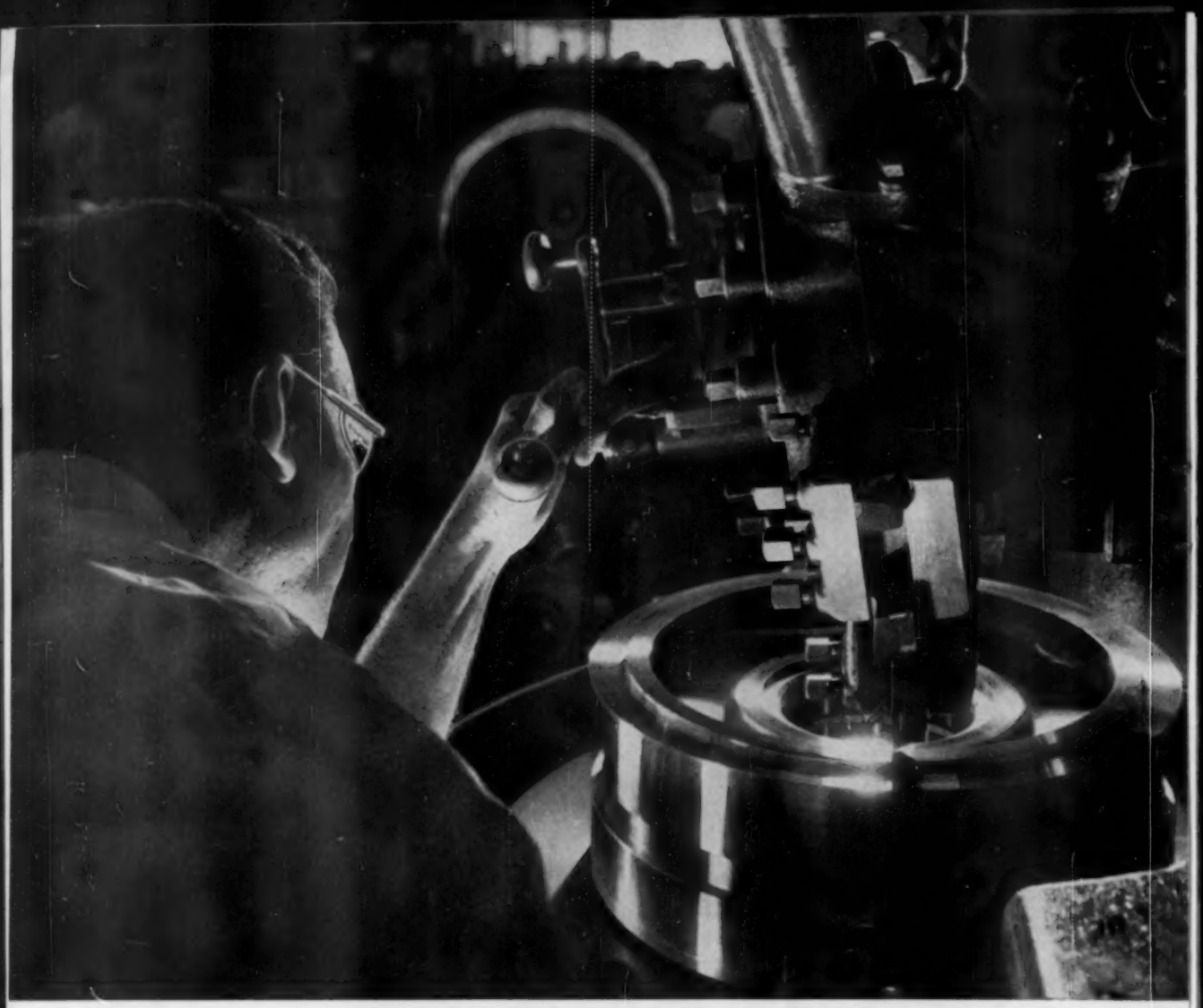

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C
D
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B Plies of heavy fabric plus high-tensile cable steel wire and wire helices at ends for exceptional strength with flexibility
C Fabric breaker strip
D Heavy mud-, abrasion- and oil-resistant tube

171,800 feet in 25 holes—and still going strong

Tough jobs are routine to the operator of this rig. Recently he had to drill through strata so hard that it took 30 days to go down just 2,100 feet. And that's only a small sample of the *171,800 feet of work turned in by his Style 3153H Rotary Drilling Hose. It already has 25 completed wells to its credit—and still looks good for many more.*

So you can chalk up another cost-slashing recommendation to the G.T.M.—Goodyear Technical Man. He specified Style 3153H Rotary Hose for this extra-severe service because it's precision-built with high-tensile steel cable reinforcement—designed to withstand high, bottom-hole pressures 15,000 to 20,000 feet down. In fact, every length is factory-tested and *guaranteed* to 5,000 psi.

And remember—Style 3153H Rotary Drilling is only one of many types of Goodyear hose. And they're only part of an entire family of industrial rubber products – designed to save time and money in oil-field work. For the full story on any of them, contact your G.T.M. through your Goodyear Distributor—or by writing Goodyear, Industrial Products Division, Akron 16, Ohio.

ROTARY DRILLING HOSE by

GOODYEAR

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Flexsteel—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

Engineered TO BEST MEET

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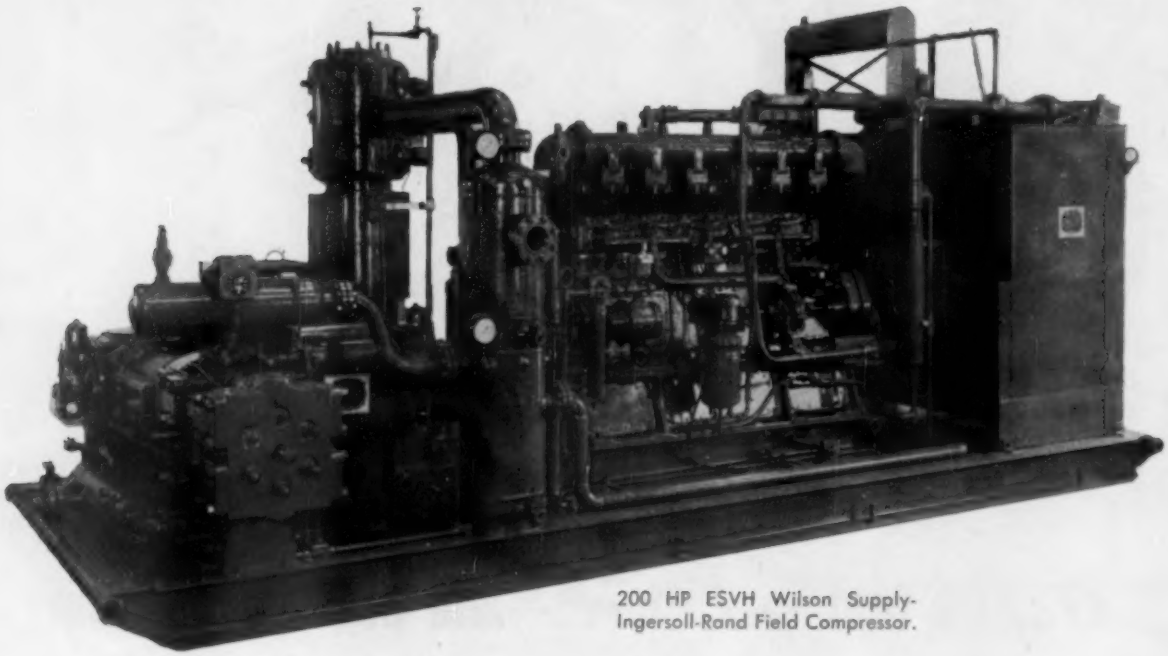
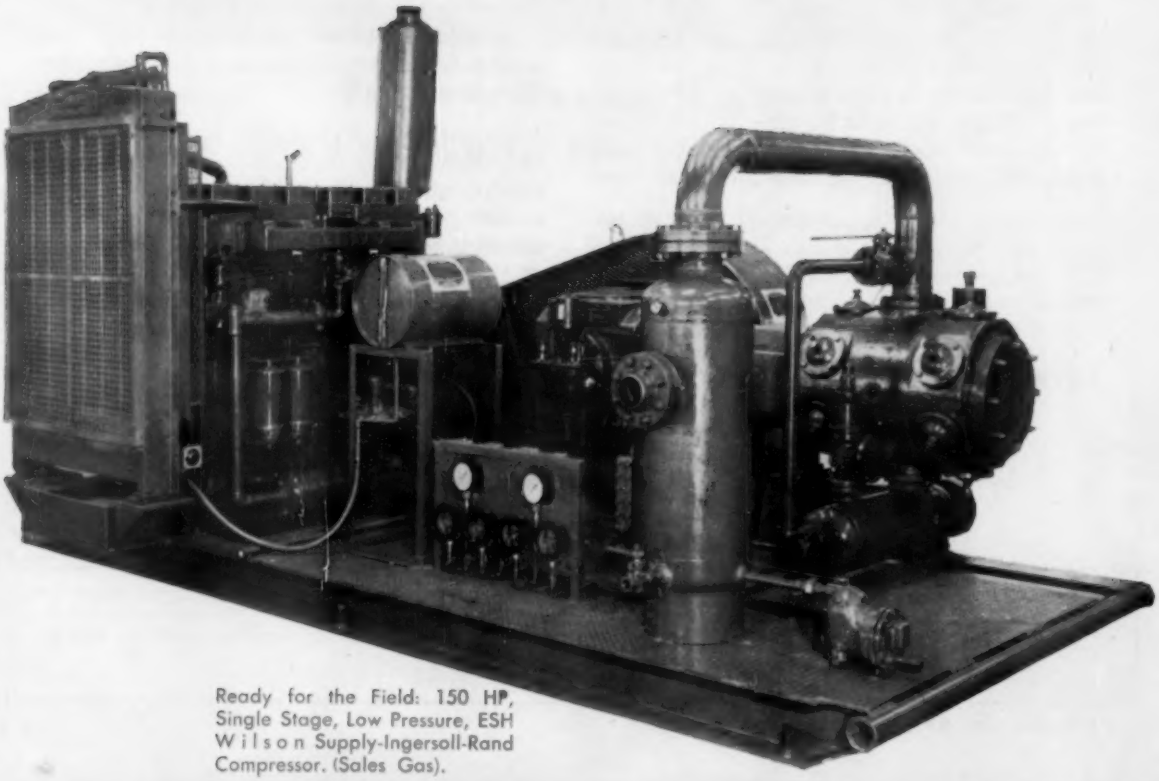


200 HP ESVH Wilson Supply-Ingersoll-Rand Field Compressor.



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The type "ESH" Compressors are completely new. In them have been incorporated features that assure continuous, low cost operation. They are adequately valved with type "A" CHANNEL Valves with "double life" seats in low and medium pressure cylinders and dependable type "K" valves in the high pressure units.

Every installation is engineered to meet specific, individual well conditions—and is completely fabricated to give trouble free performance.

These features mean profit and satisfaction to you:

Completely sealed frame.
Sealed distance-piece
Full-floating aluminum bearings.
Force-feed lubrication with full flow filter.
Window-type oil level indicator.
Low-oil-pressure protection.
Aluminum crosshead shoes.
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Full-floating metallic packing.

Contact your nearest Wilson Supply Store or write "Compressor Division," Wilson Supply Company, P. O. Drawer 19, Houston, Texas, for detailed information, and quotations. Please give suction and discharge pressure and volume to be handled.

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Cabot pumping units have a lower initial price than their quality would signify, because they are stripped of frills. Because of this quality in workmanship and materials and because of strategically located factory owned repair shops, Cabot units have unusually low maintenance and repair bills. This, plus a record of field stamina and long life, makes Cabot pumping unit cost low.

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Refueling jet planes

"The important factor of time on the ground in refueling, or for other services, is of major concern when it is realized that each minute of time lost on the ground may mean 9 miles in the air for the large jet aircraft.

"The tremendous task of refueling turbine powered aircraft can be glimpsed by brief consideration of the fact that some of the turboprop aircraft may consume as much as 2,000 gal. for a flight of 1,000 miles under normal conditions—and that an aircraft of the true jet type may consume as much as 5,900 gal. for a 1,000-mile flight under normal conditions."

R. H. Tolson, The Texas Co., in a speech at the annual meeting of American Society of Mechanical Engineers.

Let's keep prices realistic

"Sometimes we are charged with not competing enough, sometimes with competing too vigorously. Contradictory charges seem most likely to occur in connection with price wars. I cannot speak for anyone else, but I know my company does not like price wars and does not start them.

"Price wars hurt us, immediately by reducing our income and in the long run by damaging our dealer organization. They also have an eventual adverse effect on our public relations because when a price war ends —and every price war must end if those involved are to survive—the public tends to regard normal prices as excessive prices.

"We do not believe we benefit from prices that are too high. We know we will suffer over the years unless our prices are based on competitive realities, and we devote a great deal of study in our company to guard against charging prices that are competitively unrealistic."

B. Brewster Jennings, chairman of the board, Socony Mobil Oil Co., Inc., in a speech to the New England Council for Economic Development.

Demand to rise 3 per cent

"In 1958 it is anticipated that U. S. oil requirements will average close to 9.1 million barrels daily, or nearly 3 per cent higher than in 1957. Principal factors supporting this forecast

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you have!

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Branches Throughout the Oil Country

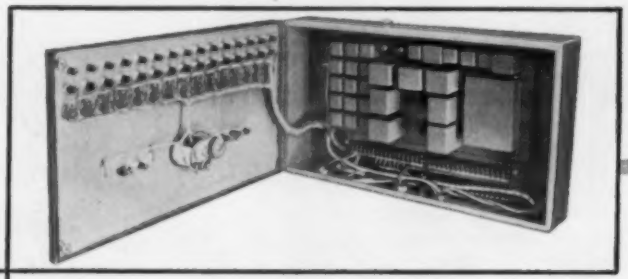
AUTOMATIC LEASE CONTROL

Individually designed and engineered!

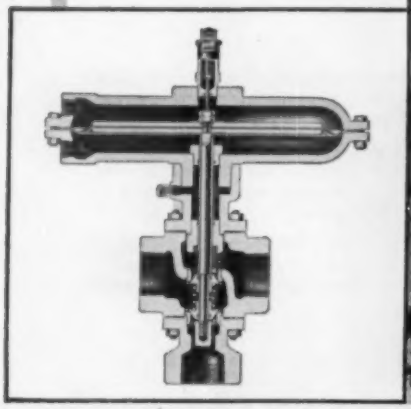
The line illustration on the right represents a typical automatic well test system. The "Cyclotest" Automatic Well Test Control Panel, pictured below this illustration, is connected to three-way solenoid actuated diverting valves installed in each flow line production manifold. A valve, when actuated, diverts the flow of oil through the well test equipment, comprised of a test separator or heater-treater and meters for oil, water and gas. Each meter actuates a momentary contact for each unit of production. This test information, in the form of electrical pulses, can be recorded by various pens in an associated strip chart operation recorder or in digital form by the CSC "Cycloprint" DATA Printer, shown below the illustration on the right. Also recorded are well identification numbers and duration of tests.

If Fisher Type 1620 three-way, 3 position valves are used in the production manifold, the "Cyclotest" panel can be provided with clocks for well flow control for automatic stop-cocking of wells.

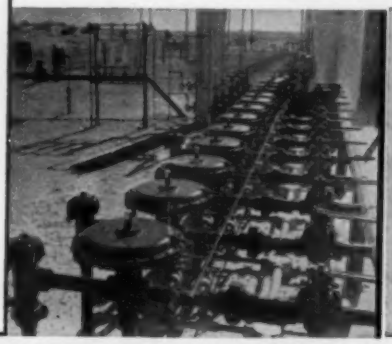
High Level Safety Float Switches, Fisher Type 2800-252V, are installed in both test and production separators. High level in Test Separator carries oil to be diverted back through Production Separator; high level in Production Separator can be used to actuate a lease shut-in circuit.



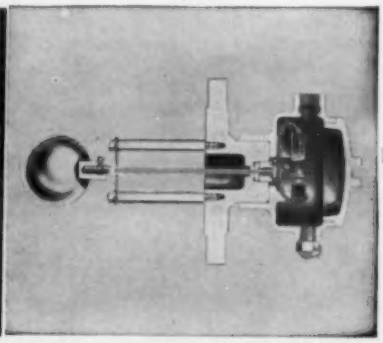
Internal Construction of CSC "Cyclotest". Individual relays are hermetically sealed and plug-in. This minimizes the need for maintenance and at the same time makes servicing of this unit quite simple. The sub-base on which the plug-in components are mounted is hinged and swings out for easy access to all internal wiring.



The Type 1620, pictured above, is a three-way, three-position valve. With no pressure on the diaphragm both ports are closed, so that this valve can be used for production control in addition to automatic well testing. The body is rated at 1500 lbs. W.O.G. working pressure and has 2" screwed connections.

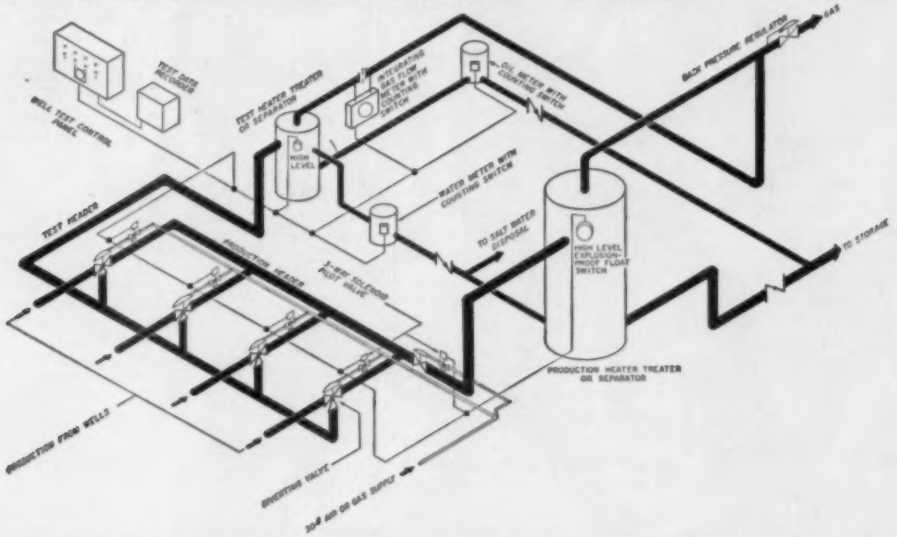


Pictured above are Diverting Valves for Well Test Manifold. Fisher offers two valve types for this service. For straight three-way service at low pressures the Type 1663A is recommended. This valve is spring loaded, diverting to the (test) position only when air is applied under the diaphragm.



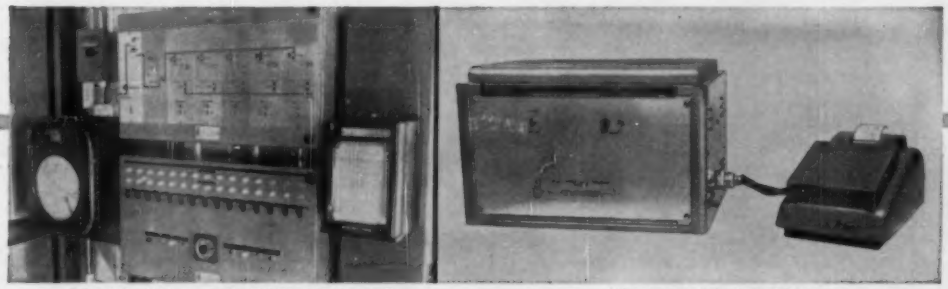
Float Level Control. The Fisher Type 2800-252V, an on-off type float switch, uses a flexure tube assembly for transmitting float motion to a Micro switch in an explosion-proof housing. Also available with Type 2805 pneumatic snap-acting pilot—interchangeable on same housing.

AND WELL TESTING EQUIPMENT



The left illustration below shows the controllers and recorders for a combination automatic tank switching and automatic well testing installation. The graphic panel is a CSC "Cyclotest" Automatic Well Test Controller for programming the testing of 15 wells. The recorder on the left is the integrating gas flow meter. On the right is a multi-pen operation recorder providing a permanent record of well test data.

The pilot lights on the "Cyclotest" indicate which wells are flowing straight to the Production Separator and which well is on test. The row of switches directly under the lights provide for by-passing wells from test sequence, for shutting wells in or for putting them on test independent of the controller. In the lower center is a 1-30 hr. timer which determines the duration of the test.



"Cyclotest" Automatic Well Test Controllers *"Cycloprint" Data Printer*

Pictured on the right in the above illustration is a "Cycloprint" Automatic Data Printer which is a multi-channel unit designed to receive pulse information from as many as 21 different sources and store this information until called for. A typical application is the recording of well test information such as barrels of oil and water, MCF of gas, test time, lease identification, date and time. The information is printed in digital form on adding machine tape.

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for increased consumption are the country's long-term population growth trend and the expectation that winter temperatures, which have been warmer than usual in 1957, will return to a more normal pattern . . .

"We foresee an average free foreign demand of about 8 million barrels daily in 1958, an increase of 10 per cent over 1957.

"Worldwide, the oil industry's ability to meet continuing increased demands hinges as in past years upon the accumulation of sufficient capital to finance necessary growth. Fulfillment of capital requirements constitutes a continuing challenge that must be met if the industry is to succeed in providing the vast quantities of petroleum needed by all of the Free World now and in the future."

R. G. Follis, chairman of the board, Standard Oil Co. of California.

New Mexico being cheated?

"I cannot escape the conviction that New Mexico is the victim of a grave injustice and that the people of New Mexico and their children are losing a portion of their birthright as long as a federal bureau (Bureau of Land Management) continues to administer these lands (unreserved public domain lands in New Mexico) and to control the depletion of our natural resources.

"As long as these vacant and unreserved acres of New Mexico real estate are administered and controlled by a federal bureau, New Mexico is receiving something less than the 'full equality in all respects' which is the entitlement of every territory which joins the Union as a full and sovereign state . . .

"I can point to very significant facts. One is that the Bureau of Land Management does not receive the income from its lands that we receive from our state lands. As a matter of fact, their income from these federal lands is less than half of the per acre income we realize from our lands.

"The second point is that every cent realized by the Bureau of Land Management is allocated by law and is spent. There is nothing being put aside for the future. When the mineral wealth is extracted from these lands, it will be gone, and there will be nothing for the future. There will be no money in the bank comparable to the $130 millions of permanent funds which the State Land Office has salted away for generations yet unborn. This is a heritage from our state trust lands which we shall leave for the future. When the oil and gas have been exhausted from our public domain lands the future will be left an empty shell and nothing to show what wealth came from the lands of their state."

Murray Morgan, New Mexico land commissioner, in a speech to the New Mexico Oil and Gas Association.

Can engineers unite?

"I have yet to encounter an individual engineer anywhere who does not desperately want real unity in the engineering profession . . .

"The trouble is that there is no agreement among individual engineers, hence none among the boards of the national societies, as to how it is to be achieved. A common meeting ground has got to be found soon . . .

"Administrative staffs of national engineering organizations usually are directed by engineers in the full-time employ of these organizations. These engineers are human too and are therefore subject to such human foibles as professional jealousy and empire-building ambitions. This, to some degree at least, may have handicapped our national aspirations for more effective unity. If so, the remedy would seem to lie in closer and more frequent communication and personal liaison between elected, nonpaid officers, and directors of the several organizations . . .

"Both Engineers Joint Council and National Society of Professional Engineers for several years have been growing in membership and influence at relatively satisfactory rates. I think the rate of growth of each may be expected to increase in the future. Thus, as matters stand, the prospect is for two stronger but still divided and frustrated 'voices of the engineering profession.'"

Mason G. Lockwood, retiring president, American Society of Civil Engineers, in a statement endorsed in principle by the ASCE board of directors.

CALENDAR

JANUARY

6-13 Short course on oil and gas law, sponsored by Southwestern Legal Foundation and Southern Methodist University School of Law, Southwestern Legal Center, Dallas.

11-12 National Oil Scouts and Landmen's Association, directors' meeting, Adolphus Hotel, Dallas.

16-18 Association of Oilwell Servicing Contractors, second annual convention, Baker Hotel, Dallas.

20-21 Compressed Gas Association, Inc., forty-fifth annual meeting, Waldorf-Astoria, New York.

19-22 Pipe Line Contractors Association, tenth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

29-31 Ninth annual Institute on the Law of Oil and Gas Taxation, sponsored by Southwestern Legal Center, Dallas.

31 Natural Gasoline Association of America, regional meeting, Skirvin Hotel, Oklahoma City.

FEBRUARY

3-4 Instrument Society of America, chemical and petroleum industry symposium on progress and trends in chemical and petroleum instrumentation, Hotel Du Pont, Wilmington, Del.

12-14 National Association of Corrosion Engineers, Tulsa section, ninth annual corrosion short course for pipeliners, Mayo Hotel, Tulsa.

13-15 National Society of Professional Engineers, spring meeting, Michigan State University, East Lansing, Mich.

16-20 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Hotel Statler, New York.

26-28 American Petroleum Institute, Division of Production, southern district meeting, Shamrock-Hilton Hotel, Houston.

28 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

3-4 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fourth annual joint meeting of Rocky Mountain petroleum sections, Cosmopolitan Hotel, Denver.

5-6 Gas Conditioning conference, sponsored by the University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla.

7 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

10-13 American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists, forty-third annual meeting, Biltmore Hotel, Los Angeles.

12-14 American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Texas, Fort Worth.

17-21 National Association of Corrosion Engineers, annual conference, civic auditorium, San Francisco.

17-21 International Atomic Exposition, Inc., 1958 Nuclear Congress, Chicago Amphitheatre, Chicago.

20-21 New England Gas Association, annual meeting Hotel Statler, Boston.

20-21 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, regional conference on production and reservoir engineering, Mayo Hotel, Tulsa.

24-26 Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

31-April 2 American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.

APRIL

1-3 University of Oklahoma, fifth annual conference on corrosion control, Extension Study Center, Norman, Okla.

9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.

13-18 American Chemical Society, national meeting, San Francisco.

15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.

16-18 Natural Gasoline Association of

Another year in our Industry . . worldwide, so let us pause to wish you one and all a Merry Christmas and a Happy, Prosperous 1958.

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WECO Unions have great durability, as a result of stronger subs and wing nuts, heavier wall construction and sturdy Acme threads. They can "take it" on the toughest jobs, and maintain their efficiency under extremes of pressures, volumes and abrasions.

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HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

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America, annual convention, Baker and Adolphus Hotels, Dallas.

16-18 National Petroleum Association, fifty-fifth semiannual meeting, Hotel Cleveland, Cleveland.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Louisiana-Arkansas, East Texas, and Mississippi petroleum sections, gas technology symposium, Shreveport, La.

20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.

21-23 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.

23-25 Second International Williston Basin Symposium, sponsored by Saskatchewan Geological Society and North Dakota Geological Society, Regina.

27-29 Independent Petroleum Association of America, midyear meeting, Hotel Sherman, Chicago.

27-30 American Association of Petroleum Geologists, Rocky Mountain section, Casper, Wyo.

28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

28-30 Southern Gas Association, annual convention, Dallas.

MAY

5-6 Society of Petroleum Engineers of A.I.M.E., North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

5-7 Purdue University, thirteenth annual industrial waste conference, Purdue Memorial Union Building, Lafayette, Ind.

5-9 American Gas Association, distribution, production, and transmission conference, Roosevelt and Commodore Hotels, New York.

7-9 American Petroleum Institute, Division of Production, eastern district meeting, Deshler-Hilton Hotel, Columbus, Ohio.

8-9 Texas Petroleum Research Committee, eleventh oil recovery conference, symposium on "A Century of Texas Oil, 1875-1975," University of Texas, Austin.

12-14 Chemical Institute of Canada, National Research Council, eighth Canadian high polymer forum, Macdonald College, St. Anne de Bellevue, Quebec.

12-14 Instrument Society of America, symposium of analysis instrumentation division, Shamrock Hilton Hotel, Houston.

12-16 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting, Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

26-28 Chemical Institute of Canada, annual conference and exhibition, Royal York Hotel, Toronto.

JUNE

8-11 American Petroleum Institute, Division of Transportation, annual tanker conference, Greenbrier Hotel, White Sulphur Springs, W. Va.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

The Original

ONE JOB we never want is writing Christmas cards and trying year after year to think up new and better ways of extending holiday greetings and expressing the age-old sentiments of the season.

It's hard enough writing a Christmas message to oil men. Oh, the first time you tackle it, it's easy. There are so many clever gimmicks with which you can exercise your originality.

For instance, you immediately think of an oil-well christmas tree. Now there's a natural! What an ingenious pun! Just get an artist to draw a picture of one with some tinsel and a stocking hanging from the valves and nipples, and you've got it made. That is, unless you've been in the business long enough to realize that somebody has been doing that every year since, well, ever since they began putting christmas trees on oil wells.

Another sure-fire, time-honored device is to write an original poem embodying Christmas wishes. We've done that more than once ourself, but our masterpiece always sounds pretty corny after it appears in print. There really isn't much new to be said about Christmas, nor many new ways to say it. The meter always gives us trouble, and besides there isn't a single word in the whole English language that rhymes with Merry Christmas.

Another very clever stunt is to write out a Christmas message and have it set in type in the shape of a Christmas tree. We did that one year, but it threw our composing room into such a tizzy that we don't care to try it again soon.

This year we almost started to write a letter to Santa Claus on behalf of all oil men, asking for a stocking filled with a strong demand, firm prices, a friendly Congress, etc., etc. Lots of possibilities in that idea. But then we remembered that we had overdone that childish angle more years back than we care to admit.

Then there's the Christmas candle. Ought to be able to do something with that . . . maybe something about oil now being the light and hope of the world . . . no, that's not quite good taste. Let's see now . . . most candles are made of petroleum wax these days . . . ought to be some tie-up there. Aw shucks — we wrote a piece about that one year. And it wasn't very good the first time.

Of course we could get real serious and pontifical and write a beautiful little sermonette about peace on earth, and maybe work in some noble sentiments about oil helping to bring enlightenment and brotherhood to all nations. But we've tried that, too, and the chief result was some pointed advice to leave preaching to the ordained clergy.

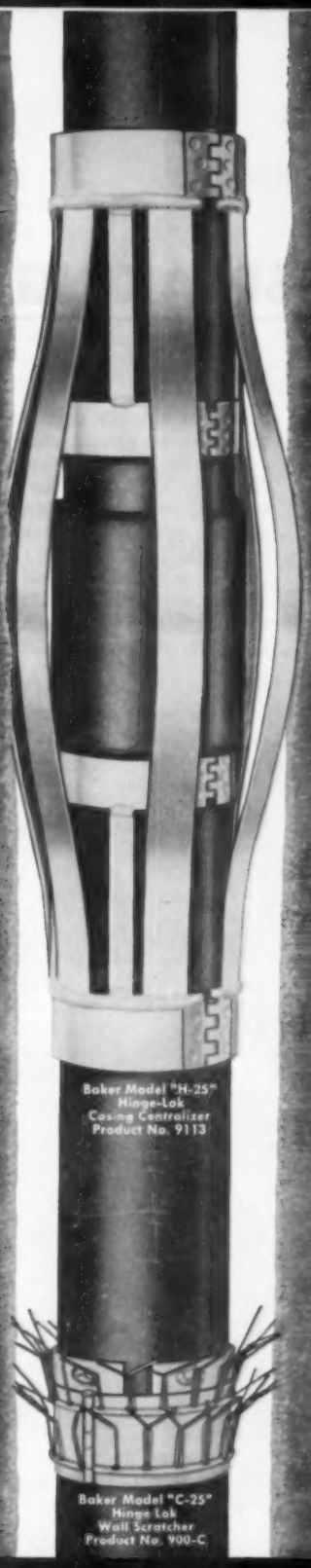
At least one year, we recall, we went to the other extreme and wrote like a Scrooge. With tongue in cheek we railed against the alleged and fancied annoyances of the season—the crowds on the sidewalks, the nuisance of addressing and opening Christmas cards, the last-minute shoppers that interfere with our last-minute shopping, and all the other standard gags. Very clever the first time—or was it?

Then there is the device of printing "Merry Christmas," or a reasonably accurate facsimile thereof, in a couple of dozen foreign languages. But we don't know any foreign languages, and besides our print shop wouldn't have all those funny kinds of type.

Nope, there just isn't any new or better way. We've been all around the horn, exhausted our ingenuity, plagiarized everybody else's ideas, tried everything. We're convinced that there is absolutely no way to improve on that good, old, standard, simple message—

Merry Christmas

—Henry D. Ralph.



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Baker Casing Centralizers are available in either the hinged (Model "H" HINGE-LOK, Product No. 9113, illustrated) or slip-on (Model "G", Product No. 910-G) models, each with a complete range of spring-bowed heights for each casing OD—one exactly right for most casing clearance programs. Baker Model "C" Wall Scratchers are also available in either the hinged (Model "C" HINGE-LOK, Product No. 900-C, illustrated) or slip-on (Model "C" Solid Ring, Product No. 901-C) models with your choice of 2½-inch (C-25) or 4½-inch (C-45) scratcher wires. Ask your Baker Representative about this *outstanding combination* for better primary cementing.

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WALL SCRATCHERS
CASING CENTRALIZERS

Christmas thoughts on industry unity

THE Christmas season, with its message of good will among men, is a time to think about unity in the oil industry.

Unity is much discussed, much desired, of late. The industry realizes it has suffered in prestige and in progress because its component segments so often work at cross-purposes.

But the industry seems unable to agree even on what unity means, let alone how to achieve it.

WHAT IS UNITY? In an industry as diverse as oil and gas, unity can't mean complete unanimity of opinion on every subject. It can't —and shouldn't—mean an end to rivalry and competition. It shouldn't—and needn't—mean suppression of minority views.

For the sake of appearances, if nothing more, one kind of unity the industry needs is a little more politeness within the family when on public display. The family can disagree at home but should put up a front of unity to defend its fair name instead of joining the mudslinging when one of its members is attacked.

To the public, anybody in any branch of the industry is an oil or gas man. A smear against one is a smear against all; repressive legislation against one can lead to repressive legislation against others. Privately the other family members may feel that a black sheep is getting what he deserves, but publicly they should ask mercy for an errant brother.

Much deeper than that, the industry needs the genuine unity of cooperation, interdependence, and mutual respect. As in the "war between the sexes," customers and suppliers often have conflicting interests and viewpoints. But since they can't get along without each other they should go to great lengths to get along with each other.

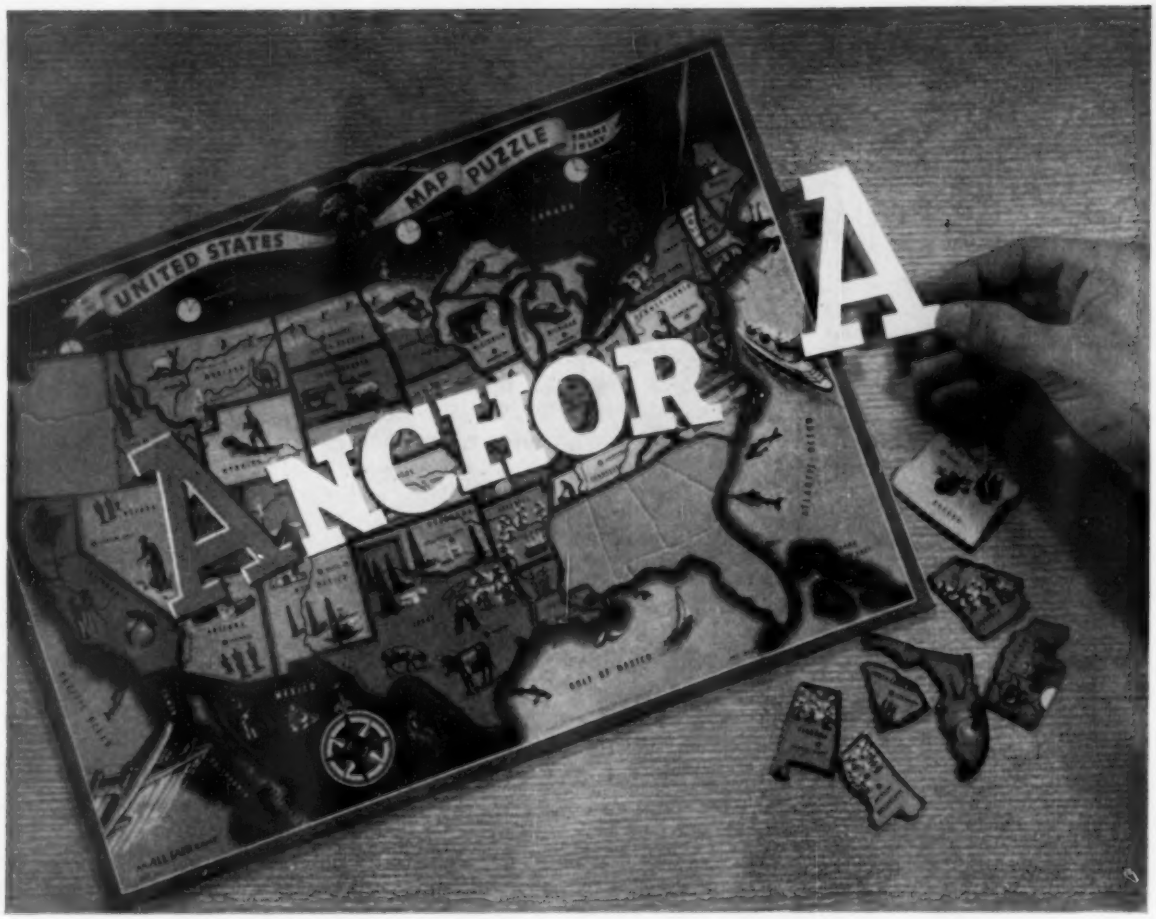
The basis for getting along better is better understanding. A very great deal of the bickering and antagonism within the industry can be laid to lack of understanding of one another's problems, viewpoints, and motives.

Only after there is thorough and mutual understanding can there be any intelligent or successful agreement, compromise, or even tolerance of divergent views.

THE WHOLE INDUSTRY is concerned about its poor public relations. It might do better to concentrate first on improving its private relations, its internal, intraindustry relations.

Its various segments need to be better educated about each other—in some cases they even need to be introduced to each other—before there can be the understanding that is the basis for unity.

And the basis for understanding is patient explanation and sympathetic listening. With a little more of these there could be progress toward peace in the industry and good will among oil men.



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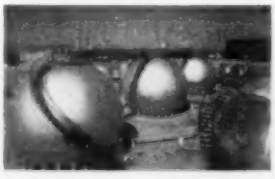


OIL AND GAS JOURNAL

December 23, 1957

Crude Prices: What the Changes Mean

Postings vary in three production areas—the Illinois basin, South Texas, and Four Corners. The industry is watching carefully for developments showing whether the present price structure will remain firm. Outlook generally is optimistic, and lower prices are blamed on local or special conditions.

OIL MEN went about their business as usual last week, but they were keeping one eye cocked on crude-oil prices.

Most felt the general price structure would hold firm—and nearly all except independent refiners were hoping they would—but scattered cuts made them a little anxious.

At the weekend this was the picture:

... **The Illinois basin** was operating with a two-price structure. The 15-cent cut posted by Sohio Petroleum Co. had spread to include roughly two-thirds of the basin's production. But several important buyers still had not joined Sohio.

... **The Four Corners area** also had twin postings, one for $3.15 and one for $2.90.

... **In South Texas** one comparatively small buyer dropped his price by 10 cents.

... **In Canada,** buyers and producers watched developments in the Tri-State area to determine what effect, if any, it could have on the price of Alberta crude.

One thing was certain: There was more talk of the possibility of a general price cut in the industry than actual fear that one might come. Most oil men were just asking their neighbors what they thought about it.

Many observers saw the developments as local ones, or the results of special conditions, that would have no decisive bearing on the general crude-oil price structure.

The Tri-State . . . Additional purchasers joined in posting a $3 price in the Illinois basin of Illinois, Indiana, and Kentucky. But several major companies—some of them producers—held firm at $3.15.

The maneuvering was touch and go, and Tri-State may develop into a two-price area for an indefinite period.

At least eight buyers have posted $3. Among the eight are Sohio Petroleum Co. (73,000 bbl. daily), which cut first; Ashland Oil & Refining Co. (71,000), the first leading purchaser to follow suit; Indiana Farm Bureau (14,600), and Lowden Pipeline Co. (4,600).

Holding the line are Carter Oil Co. (39,000), Pure Oil Co. (23,500), The Texas Co. (29,600), and Ohio Oil Co. (25,800).

Carter, Pure, and Texas are major producers in the area, as well as purchasers, and Carter has protested to Sohio the price reduction.

Sohio and Ashland blame competitive conditions and lower refinery profits for the price cut, while Carter contends Illinois basin crude is fully worth the $3.15 figure (p. 30).

Carter is now in the position of selling to Sohio under existing contracts at $3 and buying from others at $3.15. Except for its protest to Sohio, the company has made no move as yet to alter this double standard.

The Sohio reduction has touched off a demand by the Texas Independent Producers and Royalty Owners Association for a government investigation. TIPRO asked Matthew V. Carson, Jr., federal imports administrator, to find out whether the decrease will affect "national security."

"Any general price cut would render the entire imports stabilization program meaningless insofar as its objective is to preserve a healthy home industry," TIPRO President Jerome J. O'Brien wrote Carson.

South Texas . . . Tension over crude prices spread last week to Texas, where Southern Minerals Corp. cut its posted price by 10 cents per barrel for the lower Gulf Coast and Southwest Texas.

The reduction, though obviously reflecting a soft local market, was described as an adjustment to meet postings already in effect. Only eight counties and approximately 40,000 bbl. of oil daily are affected.

Somico President Maston Nixon said the change should not be construed as calling for a general crude price cut. It was made to bring crude postings into line competitively "with other domestic crudes that are coming into the Corpus Christi and Gulf Coast areas."

When crude increased 25 cents last January in most areas, it went up 35 to 45 cents in Southwest Texas and the lower Gulf Coast, Nixon said. The latest reduction, together with an earlier cut of 10 cents in July, will "adjust postings in this area to a competitive position with crudes from other parts of Texas."

The eight affected counties are Nueces, San Patricio, Jim Wells, Karnes, Atascosa, Calhoun, Refugio, and Aransas. Somico itself produces about 7,000 bbl. of the 40,000 bbl. daily it buys.

The new prices range up to $3.45 for select crude and $3.35 for light Sweden crude. Before Somico's increase of last December it was paying $3.20 and $3.10 for these crudes.

Buyers for major companies generally viewed the price cut as a local trend. They admit, however, they are watching developments closely for any indication of a general trend.

Four Corners . . . Adding to the crude price confusion is the two-price posting in the Four Corners area.

The development may have little

bearing on the industry price structure as a whole. It more likely represents a "shakedown" condition that often exists when crude from a new area begins moving to market.

Union Oil Co. of California posted a $2.90 price in four San Juan County fields in Utah, including Aneth, and in New Mexico's Bisti field. This was 25 cents under the earlier $3.15 posting of Standard Oil Co. of California and Shell Oil Co., two principal owners of Four Corners Pipeline.

At least one major producer in Four Corners has a contract with Socal at the $3.15 rate.

Shell says it has no firm $3.15 contracts at this time and is making only spot purchases of New Mexico crude to fill the line to Los Angeles. It is moving its own oil from the Utah section of Four Corners.

Union Oil President A. C. (Cy) Rubel says $2.90 per barrel "is what Four Corners crude is worth to us according to our calculations."

Asked whether he thought he could buy any crude at that price, Rubel replied, "We probably won't get any, but that's our price."

Opinions differ as to whether the $3.15 price is "realistic." Rubel said the pressure of surplus crude should affect crude prices "unless the voluntary import curtailment program straightens out the situation." Socal countered that the $3.15 field price is competitive with comparable gravity crude produced in California, and others said it also is competitive with imported crude.

Rubel said a cut of 50 cents a barrel, under prevailing conditions, would put prices at a realistic level, although Union has no plan to lead such a move. Imports and domestic crude are now running about 100,000 bbl. daily above demand in California.

Canada . . . There is strong pressure in Canada to prevent the Tri-State price cut from spreading to Alberta. The price for Alberta crude is tied to the Illinois basin through the common marketing area at Sarnia.

At Toronto, Imperial Oil, Ltd., is watching carefully the Tri-State development. Imperial is western Canada's largest crude buyer, and its posted price is affected by the so-called Sarnia Equation. Under the equation, crude is laid down competitively to Sarnia refineries from both the Illinois basin and western Canada.

Imperial's executive vice president, W. O. Twaits, said frankly last week he is personally disappointed at the Tri-State cut and hopes it will not spread. Imperial, he said, is "watching it with intent interest" but does not anticipate "any immediate action."

Twaits said any danger of a cut in Canadian crude prices has been lessened by a drop in the value of the Canadian dollar. The international exchange rate has a direct bearing on such prices.

The exchange rate has sagged sharply in the past few weeks—"and this keeps us in pretty good shape against this decrease," Twaits said.

Explaining further: "When the exchange value goes up (for the Canadian dollar), our Canadian price must be lower. Conversely, when it is down, the Canadian dollar buys less, and our price must go up."

The brighter side . . . While there is some apprehension over prices, most industry observers are inclined to take the optimistic view that price reductions made so far do not represent a general downward trend but have local or special application only.

Some reasons given:

. . . Cold weather is beginning to make itself felt on fuel oil stocks.

. . . State conservation commissions have been holding allowables down.

. . . Stocks of crude and products appear to be holding fairly stable at a time when refinery runs normally are nearing a seasonal peak. Gasoline stocks apparently won't build up as much as in preceding winters.

One major-company crude buyer pointed out that major companies still haven't joined in the price cut in the Tri-State area and that, in southern Texas, Somico isn't a big buyer and sells largely to independent refiners in the Corpus Christi area.

Another optimistic report came from Cambridge, Mass., where President Albert L. Nickerson of Socony Mobil Oil Co. told a Harvard law school club that crude prices should remain firm through the winter.

"Although there has been a little erosion around the edges, on balance I am inclined to think it will hold," Nickerson said. "I believe the worst is behind us."

FPC Enters Kansas Gas Case

THE RIGHT of Kansas to fix a minimum price for gas at the wellhead suddenly has become a national issue.

This sudden switch for a local case came when the Federal Power Commission filed a "friend of the court brief" with the U. S. Supreme Court in the appeal of Cities Service Gas Co.

Cities Service was appealing a Kansas Supreme Court decision upholding the Kansas Corporation Commission's 1953 order setting a minimum price of 11 cents per M.c.f. for gas from Hugoton field (OGJ, Dec. 17, 1956, p. 86).

FPC asked the U. S. court to reverse that decision. It contended that the order "directly conflicts with the exclusive jurisdiction of the FPC to regulate wholesales of natural gas by producers to interstate pipeline companies."

Minutes of the October 10 meeting at which the filing was authorized disclose a commission rift over the matter.

Commissioners Seaborn L. Digby and Arthur Kline, opposed to federal invasions of state's rights, voted against putting the FPC into the case.

What it says . . . The FPC argues in its brief that the Kansas order is substantially identical to an Oklahoma order held invalid by the court in 1955.

It dismisses the difference between them—the Oklahoma order fixing prices at the tailgate of the processing plant—declaring that both have "precisely the same prohibited effect" on interstate commerce.

Wellhead sales are plainly sales in interstate commerce, the FPC argues. Its jurisdiction over them is not impaired by the exemption of production or gathering in Sec. 1 (B) of the Natural Gas Act.

"By requiring producers to charge a minimum rate in selling their gas to pipeline companies, the state order effectively undercuts the right of the power commission to regulate the maximum price for such sales," the court was told.

The FPC contends there is no question of an accommodation of state and federal regulatory functions. It is well settled, it says, that where the federal Government imposes regulation the states cannot interfere with it.

The courts have held several times that state regulation of price in producing areas is equivalent to fixing the price to the ultimate consumers and is beyond the power of the state, the court was reminded.

"No matter how it is viewed, the Kansas price-fixing order conflicts with the exclusive jurisdiction of the FPC under the Natural Gas Act to regulate the rates charged by producers in making wholesales of natural gas in interstate commerce," the commission concluded.

Security Analysts Go to Oil School

● Socony Mobil management turns teacher for one big reason: It feels the money available to finance its future growth may depend on what investing public thinks of its stock.

OFFICIALS of Socony Mobil Oil Co. see a double trend developing and are moving to take advantage of it.

The outlook is this: Future expansion needs of oil companies will be too large for oil-company profits alone to finance. Oil men will have to turn more to the investing public. At the same time, more and more people will be looking over good stocks for investments.

With this trend in mind, Socony is setting about to educate investing people about the oil business and about Socony in particular. Its first approach is a school for security analysts, key contact men with investors.

Big sendoff . . . And Socony tapped a gold mine in its first school.

Plans called for a single course of five sessions meeting for an hour and a half on Thursday afternoons.

Invitations were issued, and 400 acceptances flooded in. The result was that Socony enrolled 89 in the first course, which was completed early this month, and now plans to repeat the sessions at least several times more. All of them will be set up jointly by Socony and the education committee of the New York Society of Security Analysts.

J. F. Seal, a member of Socony's board and vice president for finance, frankly told the opening session why Socony was interested in getting its financial story across.

He cited a recent estimate by Chase Manhattan Bank that the oil industry will need $130 billion for capital outlay in the next 10 years and added: "Many companies in the industry will be turning to the investing public to meet some of their capital requirements, just as Socony Mobil did this year."

Seal fitted security analysts into that picture this way: "If the past few years are any indication, more and more people will be contemplating buying stocks for the first time. Many of them will be seeking your advice as professional investors. Consequently, we believe that anything we can do to help you understand the oil business and evaluate the industry's prospects will ultimately make both your job and ours simpler."

Donald H. Randell of Matson & Co., speaking for the analysts, declared: "This is the first time to my knowledge that a leading company in a great industry is taking the very constructive step of helping analysts really to understand the fundamentals of that industry's diverse but fascinating activities."

Heavy course . . . Scope of the course is apparent from the subjects covered.

The first session viewed a film entitled "In The Beginning," heard Staff Geologist A. R. Nielson discuss oil-industry geology and W. L. Fellows, senior staff geophysicist, talk on the search for oil.

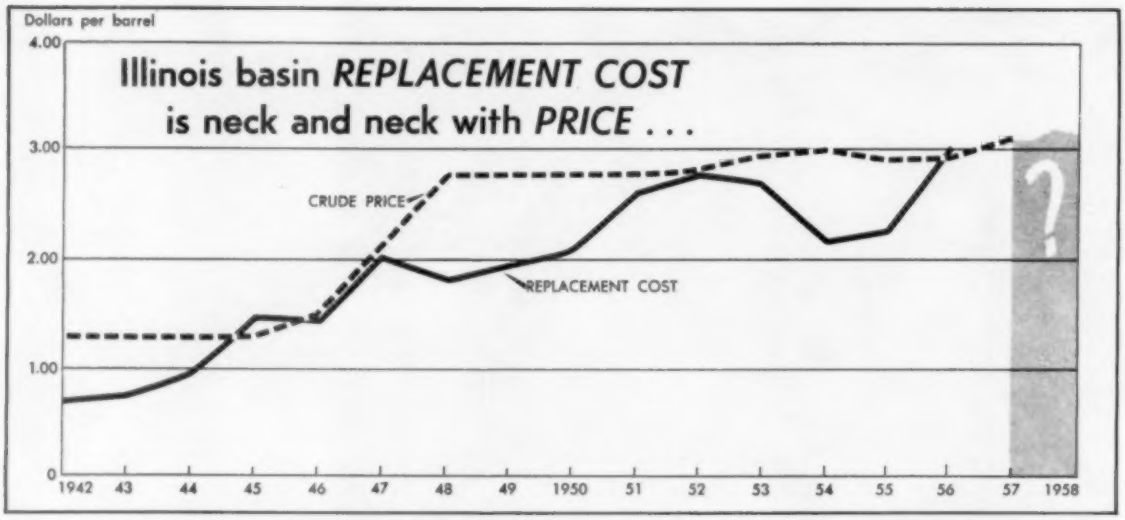
The second meeting covered land acquisition, drilling, and producing.

Transportation and manufacturing were topics at the third meeting. These phases of the industry were covered by B. M. Matheson, manager of the ocean traffic division; H. S. Danner, pipeline engineer; and L. B. Van Ingen, assistant senior engineer of the refinery engineering department.

Accounting and financial analyses of the oil industry were covered by speakers at the fourth class meeting.

The final class studied oil-industry research and economics. W. J. Borns, technical director of the general laboratory division, outlined research. J. A. Coble, manager of the domestic petroleum division of the economics department, discussed supply and demand.

The first group has just completed this inside survey of the oil industry and Socony's operations. When all the 400 security analysts have been oriented, Socony figures it will have taken a big step in making the oil industry's financial problems clear. It could make a difference down the line in keeping a flow of money into the oil industry to finance the future.



Costs Threaten Tri-State Producers

Income from crude oil in the Illinois basin is now less than the cost of finding and producing it, Carter Oil Co. concludes. Replacement cost set at $3.05 a barrel, plus any increases in expenses since the end of 1956.

THE COST of replacing a barrel of Illinois basin oil is greater than the posted crude prices for the area.

Carter Oil Co. economists reached this conclusion on completion of a study of costs in the Tri-State area.

Although the company's formal report has not yet been finished, Carter released results of the study while the price of Illinois basin crude still was unsettled following Sohio Petroleum Co.'s 15-cent cut (see p. 27).

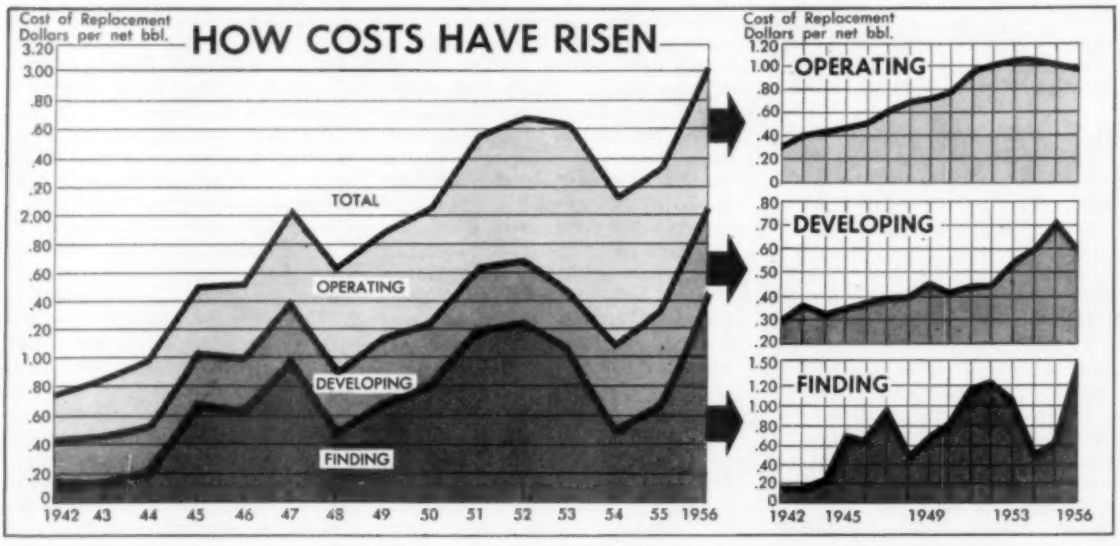
The study is the second in a series on producing areas. The first, on Oklahoma and Kansas, was released last summer (OGJ, Aug. 5, p. 46). It also showed that replacement costs were greater than the crude price.

The current study shows that at the close of 1956, replacement cost of a barrel of Illinois basin oil was $3.05. Price at that time was $2.90. In January the price rose to $3.15, but increases in steel and equipment, prices and wages, combined with a lower success rate in finding new oil, have more than wiped out any margin that might have occurred.

The new study, as in the previous one, breaks down replacement costs into three categories and compares their rise over the past 15 years. The three:

. . . Finding oil. The cost rose from 16 cents per barrel during the war year 1942 to $1.45 in 1956. This includes full credit for water-flood oil from the reservoirs found during the period.

. . . Developing production. The cost rose from 29 cents per barrel to 60 cents between 1942 and 1956.



. . . Operating expenses. The cost rose from 33 cents per barrel to $1 during the 15-year period.

The three factors, when totaled, mean that it cost 78 cents to replace a barrel of oil in 1942 and $3.05 in 1956.

Variations . . . The Carter study shows that replacement costs generally rose year by year throughout the 15 years, although there have been some variations.

During most of the time the crude price has topped replacement costs. The two periods when this has not been true occurred in 1945 under war controls, and in 1956—continuing through the current 1957.

Exploration costs went up abnormally in 1951-53 because of so-called "inefficient" money from outside the industry. They dropped back in 1954 because of a weak market but began a rapid rise again in succeeding years.

This year the over-all replacement cost has risen again, although the Carter study does not attempt to go beyond 1956. A general wage increase occurred last spring, and steel and equipment prices rose during the summer. Cost trends for the future appear to be upward.

Carter places partial blame for the drop in drilling for 1957 on rising replacement costs. In the Illinois basin, 25 per cent fewer pool wells and 14 per cent fewer wildcats were drilled during the first 9 months of 1957 than in the same period of 1956.

Views on price cut . . . In a separate statement, issued at the time the study results were released, Carter said the price cut in the Illinois basin is "unjustified" for reasons other than high replacement costs.

"The alternate sources of crude supply for Illinois basin refineries appear more expensive than the local crudes," the company said. "At the old price of $3.15 per barrel, Illinois basin crude was the best bargain to the refiner."

The company cited comparative basic crude costs for Illinois, Mid-Continent, East Texas, and Rocky Mountain areas showing that typical prices for crude at the refinery are lower for Illinois than for the others.

"It is difficult to understand why prices should be forced downward on the one crude available to northern Mid-Continent refiners which already was the best bargain," Carter said.

"It is undoubtedly true that supply and demand factors affect the price of all commodities, but when the price of one commodity is lowered below that of its competing sources, such a reduction seems discriminatory."

Phillips Hearings End

. . . after 18 months of testimony on controversial gas-rate issue. Company has spent more than $1 million in defending rates, and decision still may be a year off.

THE FEDERAL POWER Commission has set the stage for the final phase of its 3-year study of Phillips Petroleum Co.'s gas rates.

When Presiding Examiner Joseph Zwerdling closed more than 18 months of hearings on the vital case last week, he still faced:

. . . Reading some 18,000 pages of testimony.

. . . Filing of briefs and reply briefs by both parties.

. . . Examiner's report and oral argument before the full commission.

Final action of the FPC may come toward the end of 1958 or early in 1959. The FPC's decision, however, may merely serve to move the fight to a new arena.

Phillips' officials say that if the FPC doesn't give them adequate rates they will go to the courts. But they expect that if the ruling displeases some of the intervenors they, too, may appeal.

A long fight . . . The history-making Phillips case actually had its inception 9 years ago.

The FPC started its probe of the company's rates in 1948. Three years later it held it had no control over the prices of independent gas producers.

The State of Wisconsin, the Wisconsin Public Service Commission, and the cities of Detroit, Kansas City and Milwaukee contested the ruling.

The FPC decision was reversed by the District of Columbia Appeals Court. The U. S. Supreme Court affirmed the decision June 7, 1954, imposing control of independent producers on the FPC.

The case was revived by the FPC 5 months later, under that ruling. Since then, a Phillips official estimates, the company has spent more than $1 million in defending its rates.

What's at issue . . . More than the rates alone are involved in the case. Policies to be followed by the FPC also are at issue.

Phillips, for instance, is fighting an attempt by the FPC staff to have producer's costs allocated between gas and oil.

A company spokesman pointed out that allocations could be made in such a way as to keep gas rates down at the expense of oil operations. It also could lead to constant changes in rate base. For instance: A well expected to produce 80 per cent oil and so charged to oil operations turned out to produce 80 per cent gas, and vice versa, would mean rate changes.

Rate of return also is at stake. Phillips is asking for 12 per cent after costs are determined. The FPC staff has proposed a rate of 9 per cent. Opinion differs between intervenors, with the State of Wisconsin suggesting a return of 7¾ per cent.

There also is conflict between the parties over the prices to be allowed the company.

Phillips contends that its present rates are $44 million a year too low, figured on cost of service. It will ask the FPC for an increase, but will not suggest any specific amount. Phillips will point out, however, that higher rates are necessary if exploration and development are to continue.

Rigs Fail to Sell

at auction in California of drilling company equipment.

BUYERS bought everything but the rigs last week when physical assets of the Gene Reid Drilling Co., Bakersfield, were sold. Bids were submitted on the five rigs but were too low to be accepted.

Buyers quickly snapped up the 5-acre office and yard site, the office building, all the incidental equipment in the yard, all the office equipment, trucks, and miscellaneous items. But the auctioneers failed to get rid of the rigs.

The rig inventory listed a National 55 rig that had drilled only nine holes, an Ideco 525, an Ideco H-40, A Mobile slim-hole Hopper GTA-6-110, and a Unit Rig & Equipment Co. rig with a 96-ft. Bender mast. All the rigs were complete and ready to make hole.

Out of more than 500 registered bidders at the sale, the high bid was a telegraphed offer of $200,000 for the National 55 rig. The highest on-the-spot bid for the same rig was $190,000. High bid for the Hopper slim-hole rig was $110,000, about one-third the amount the owner estimated he had invested in it.

Imports Touch Low Point

. . . of 658,300 bbl. daily in November. This big drop of 108,700 bbl. draws praise from Controls Boss Carson.

COOPERATION of companies importing crude oil into this country produced its greatest results last month.

The monthly report of Capt. M. V. Carson, administrator of the voluntary controls program as a result showed this situation:

. . . **Daily receipts** for November of 658,300 bbl.

. . . **Drop from month before** totaled 108,700 bbl.

. . . **This means imports** are 113,100 bbl. daily below the quota level of 771,400 bbl. established by the cabinet committee.

Carson pointed out that November was the second straight month in which crude imports were held below the recommended level.

"We are extremely pleased by the continuing progress recorded by the oil companies," the administrator said. "Their efforts are highly gratifying and indicative of their interest in making the voluntary program a success."

Carson noted that Tidewater Oil Co., which has never formally accepted its quota, brought its November imports down to within 1,400 bbl. of its quota.

"We hope Tidewater can continue to hold its imports down," he commented.

The low point . . . Importers' estimates for the next 5 months indicate that the low point of the movement has been reached.

December entries are estimated at 830,400 bbl. daily. The high for the period will be 842,000 bbl. daily in January. Then February will show a drop to 810,800 bbl. daily.

A slight upturn in March will bring average expected receipts to 817,500 bbl. daily, but in April they will drop to 795,600 bbl.

Carson noted that the average for the next 5 months will be 819,300 bbl. per day. This will be 48,000 bbl. above allocations.

A study of estimates against actual receipts since the start of the program, however, shows this: The estimates have averaged 50,000 bbl. daily above actual entries. On that basis, the actual imports over the next 5 months should be close to the recommended level.

The list of companies proposing to import crude in 1958 has been increased to 10 by notices filed by 4 more companies. The latest 6-month notices came from Southland Co., Yazoo City, Miss.; Texas City Refineries, Texas City, Tex.; Chemoil Corp., New Orleans, and Jenney Manufacturing Co., Boston.

Hearings on all pending applications are expected to be called by Carson early next year.

West Coast ruling . . . Formal orders putting a voluntary import control program into effect on the West Coast were issued last week after having been held up while the State Department advised interested foreign governments of the plan.

The cabinet committe report recommending a cutback in first half 1958 imports to less than 230,000 bbl. daily was signed by President Eisenhower before he left for the Paris meeting of the North Atlantic Treaty Organization December 13 (OGJ, Dec. 16, p. 69).

Diplomatic protocol, however, called for formal advices to the countries whose oil sales to the U. S. will be curbed by the plan, rather than letting them learn of it through press reports. Principal exporting countries involved are Saudi Arabia, Kuwait, Venezuela, and Canada.

East of California Imports

(Thousands of barrels daily)

Company—	November (actual)	April 1958 (estimated)	Allocation
Old Importers			
Atlantic Refining Co.	75,800	62,600	58,900
Gulf Oil Corp.	101,200	104,000	111,600
Sinclair Oil Corp.	45,600	59,700	62,200
Socony Mobil Oil Co., Inc.	58,900	67,100	67,100
Standard Oil Co. of California	33,700	65,300	66,800
Standard Oil Co. (N. J.)	57,000	75,000	66,800
The Texas Co.	43,900	33,300	54,500
New Importers			
Cities Service Co.	18,000	37,000	32,600
Crown Central Petroleum Corp.	.....	6,000	5,000
Eastern States Petroleum Co.	27,000	27,000	18,300
Gabriel Oil Co.	.....	11,700	7,500
Great Northern Oil Co.	23,900	33,000	33,000
International Refineries	9,800	13,000	12,300
Lakehead Pipe Line Co.	1,700	300	300
Lake Superior Refining Co.	5,300	5,300	5,000
Northwestern Refining Co.	12,800	14,000	13,500
Phillips Petroleum Co.	.....	12,000	12,000
Shell Oil Co.	2,000	5,000	7,500
Standard Oil Co. (Ind.)	24,900	29,000	29,800
Standard Oil Co. (Ohio)	13,400	12,000	8,200
Sun Oil Co.	56,600	45,200	50,400
Tidewater Oil Co.	35,400	60,000	34,200
Southwestern Oil & Refining Co.	3,800	3,600	2,900
Bay Petroleum Co.	4,000	5,500	3,200
Dow Chemical Co.	3,600	5,500	300
Texas Asphalt & Refining Co.	.....	3,500	2,300
Total	658,300	795,600	771,400

New Ruling in Lease Dispute

THE TEXAS SUPREME COURT has ruled that an operator can keep an oil and gas lease in force by deepening an old hole.

The suit was brought originally by L. E. Boley et al, owners of 490 acres of land in Jack County. The landowners leased the acreage, which contained three abandoned wells, to Wesley Kothman. Kothman in turn assigned the leases to William E. Thomason, J. C. Culpepper, and Caprock Producing Co. Leases were for

1 year with a clause calling for a well to be started within 60 days. The lease holders deepened one of the old wells and redrilled another. Both were completed as gas producers within the required 60 days, with income estimated at $1,000 a month.

The landowners filed suit to terminate the leases, arguing that reworking old wells was not the same as actually drilling a new well. They were upheld by a trial court and the Fort Worth Court of Civil Appeals. Both decisions were reversed in the new ruling.

British Line Built

to help move methane soon to be imported by ship.

A LOCAL British gas board has forged the first link in a pipeline chain that is expected to tie imported natural gas into the country's town-gas system.

North Thames Gas Board has built a 15½ - mile, 24 - in. pipeline from Shellhaven refinery to Romford. When the line opens in April after testing, it will take waste gases from the 75,000-bbl.-daily refinery of Shell Refining & Marketing Co., Ltd.

This step is only the beginning. The line will be extended to the 31,000-bbl.-daily Coryton plant of Mobil Oil Co., Ltd., where it will pick up more tail gas. A final section will be built to Canvey Island, where it will take natural gas imported by ship as a liquid.

The gas board plans to build the extensions to Coryton and Canvey Island next summer.

In the first stage, the gas board will take 4,000 M.c.f. daily from Shellhaven. The rich tail gas is rated at 1,500 B.t.u. per cubic foot. An 80,000-bbl.-daily expansion program at the refinery will be completed by midyear.

The feed into the town-gas system would increase further when Coryton gases are added.

The gas board, however, is counting on imported methane for the bulk of its line feed. If the plan works to bring in liquid methane at —250° F., the line eventually will carry 240,000 M.c.f. daily.

The tail and imported gases will be tailored to fit the requirements of the present distribution system at new facilities at Romford.

The spectacular plan to ship natural gas by tanker will be tested within a few months. A ship for this purpose is being fitted at Mobile, Ala. Special tanks are under construction at Canvey Island (OGJ, Dec. 16, p. 59).

watching WASHINGTON

. . . with Bertram F. Linz

● Seaton cool on quota law

EFFORTS TO WRITE oil-import quotas into the Trade Agreements Act next year are likely to get little support from the department now most concerned with the import problem.

Interior Secretary Seaton has given much thought to the subject since the voluntary control program was tossed into his lap last July by the cabinet committee.

Seaton is said to have reached a belief that the writing of controls into the law wouldn't make them any more effective than he hopes the voluntary program will be.

If the new West Coast controls work out as well as those in the East promise to, it is probable the two will be merged into a single program next spring. If the effort brings imports into reasonab'e relation to domestic production, the administration will have a strong argument against a quota law.

A big argument against quotas is the possibility of court actions by importers, challenging the law as confiscatory and tying it up for months.

● Birds and bees may get company

INTERIOR'S NEW RULES on drilling in wildlife areas are likely to be something less than the almost total ban planned by Secretary Seaton.

Wyoming's Governor Simpson, after a talk with Seaton, is sure that the regulations will be eased. The result may not be entirely satisfactory to anyone. But it will permit search for needed new oil reserves. And it will provide protection to wildlife.

Senator O'Mahoney, also of Wyoming, has threatened to hold a full-scale probe of the new rules if Seaton doesn't revise them. But neither he nor Seaton wants an open fight because of the strong political influence of the conservation interests.

This leaves Seaton in a bad spot for any back-tracking will be bitterly fought by the wildlife groups. And they have the most powerful lobby that Interior has to deal with.

The conservationists are making a strong fight to have Seaton stand firm behind his original proposals. More than 10,000 letters have been received by the department. Probably less than 1 per cent favor opening of the game preserves to drilling.

● Future dim for leaf rakers

GOVERNMENT and industry leaders are uneasily watching the spread of unemployment.

The November jobless total touched the 3.2 million mark. That's the highest for the month since 1949. Labor Secretary William P. Mitchell fears that as many as 5 million persons may be out of jobs by spring.

Organized labor has its own answer to the problem. The AFL-CIO convention in Atlantic City this month said that higher wages and a shorter work week would put people back to work. But Washington says the remedy won't come quite that easily.

The "why" of unemployment is one of the tough questions that must be answered before a cure can be cooked up. A dozen men called in recently by Mitchell had a dozen answers. Market saturation, tight credit, and fears raised by the President's illness were among them.

One thing seems certain. If the Government has to act to increase jobs it will aim at doing it through incentives to industry. Public works, leaf raking, and CCC camps, tried in the 30's, are out.

New Corrosion Caliper

. . . for oil-well tubing features separate stylus for each trace. Kinley says new tool is economic and more efficient and accurate than old one-stylus instrument.

M. M. KINLEY CO. of Houston has unveiled its new corrosion caliper for oil-well tubing.

The new caliper has 15 feelers, each with an independent stylus to record its trace. While most tubing calipers now in use have several feelers, they record only one trace for all.

Since it does record 15 separate traces and because of other design changes, Kinley makes these claims for the new caliper:

. . . **Ring and line corrosion** shows up clearly, as well as individual pits.

. . . **A firm base** is given on which to estimate remaining strength of the tubing.

. . . **Accuracy is not lost** because of off-center movement.

. . . **Wear of feelers** does not affect accuracy badly.

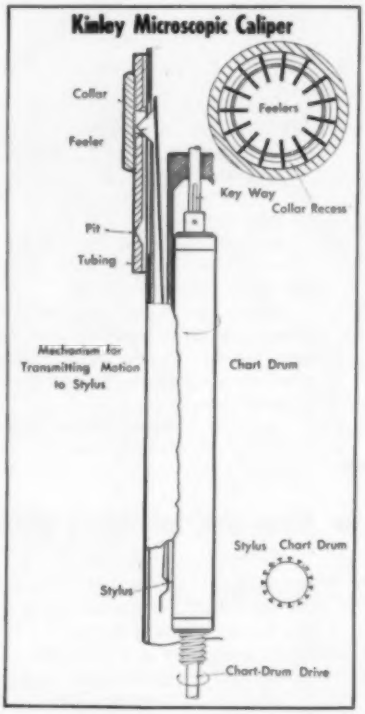
. . . **Stylus is not subject** to "overtravel."

. . . **Up to 14,000 ft. of tubing** can be calipered in a single run.

. . . **Well temperatures and pressures** do not affect the caliper.

. . . **Less harm is done** to protective coatings inside tubing.

. . . **It costs little** or no more than other tubing caliper surveys.



RING CORROSION can be clearly recorded with Kinley's new tool, a big advantage over the one-stylus caliper.

How it works . . . The new tool is run on an ordinary piano-wire line. Record is made inside the instrument itself on a chart that is only 8 in. long and 1 in. in diameter.

The grooves made in the chart of each stylus are smaller than those on an LP phonograph record and must be read with a microscope. For that reason, Kinley calls it the "microscopic caliper." For the operator's record, the chart is enlarged enough to be read easily without magnifying it.

Kinley has calipered more than 20 wells successfully with the new tool. The company will not run the tool commercially, but has already licensed it to several wire-line service companies. Kinley hopes the new caliper survey will be available through these companies on an unlimited basis within the next few months.

No newcomers . . . The new tool was announced by Jack Kinley, general manager of the M. M. Kinley Co., at a meeting of the petroleum group of the South Texas section of the American Society of Mechanical Engineers in Houston.

Jack Kinley and his father, world renown oil-well fire and blowout fighter M. M. Kinley, developed the new tool.

The Kinley Co. claims to have conceived the idea for the first oil-well caliper in 1937. M. M. Kinley then developed an open-hole caliper, a forerunner of the tools used commonly today. Kinley Co. also licenses the most widely used present-day tubing calipers.

Kinley had become interested in developing a corrosion caliper after fighting an oil-well fire which was caused by a corrosion leak.

Old tools had problems . . . Kinley claims there are several inherent shortcomings in a caliper tool with only one stylus.

Chief among these is the fact that a single stylus cannot record the difference in ring corrosion and a simple pit. Moreover, when the tool runs off center or when one or more feelers is worn, the stylus record is thrown off so much that deep pits may not be recorded at all.

Also, the single-stylus instrument had a characteristic "kick" which it recorded as a result of overtravel at tubing collars and other deep depressions. As a result it was difficult to tell exactly how deep a corrosion pit really was.

According to Kinley, the new tool does away with the bad effects of off-center travel and feeler wear. Because of this and because it does not overtravel at collars and elsewhere, the company expects to be able to make a close estimate of the actual depth of corrosion pits or rings. Then, the well's owner gets a good idea of tubing strength and can judge when and if he should pull the tubing to replace bad joints.

Longest string of tubing yet calipered with the new tool was about 9,000 ft. However, the company says the chart is capable of recording up to 14,000 ft. of survey. Friction wheels on the outside of the tool engage the tubing and turn the chart as the tool is pulled from the hole.

Kinley says that old-style calipers often damaged the protective coatings applied to the inside of oil-well tubing. The metal feelers were pushed against the sides of the tubing with enough force to cut it at times. Then, corrosion could eat the tubing at these scratch marks.

To guard against this in the new tool, Kinley has cut the force held against the feelers by about 50 per cent. Exactly how much this will help has not been determined.

Louisiana Curbs Lease Sales

THE LOUISIANA State Mineral Board will resume leasing of state lands in January, but frequency of future sales has been cut in half.

Because of dwindling receipts from recently granted oil leases, the board canceled its scheduled lease sale in December. At the same time an indefinite moratorium was called on leasing to permit the board to study possible revisions in its policies (OGJ, Dec. 9, p. 85).

The next state lease sale has been set for January 16. However, Board Sec. C. J. Bonnecarrere announced that until further notice future lease sales will be held bimonthly. In the past, sales had been on a monthly schedule.

Bonuses from 1957 sales are nearly $20,000,000 below the total of approximately $47,750,000 received last year.

Sound Jars Crude From Sand

. . . in latest approach to Athabasca problem. Tests are now being made to design equipment for big operations.

A CANADIAN RESEARCHER has come up with the idea that highly pitched sound waves, inaudible to the human ear, may succeed where other processes have failed in separating oil from the famous Athabasca sands.

The oil sands found in northern Alberta are estimated to contain from 100 to 300 billion barrels of reserves. So far a commercial way to extract oil from the sand has defied oil researchers.

Originator of the latest process is J. P. J. Fitzgerald, managing director of Sonic Oil Co., which is directing advanced research tests on the idea.

Fitzgerald claims he has found that sound waves of specific ranges and great intensity have a definite effect when passed through bituminous sands.

The effect is this: Dynamic behavior of gas bubbles is built up around each grain of sand. The bubbles collapse with terrific implosive force at the rate of 25,000 times per second. The resulting agitation is several times the force of gravity. The process will separate the oil at normal temperatures in a matter of seconds, according to Sonic Oil.

Equipment required resembles a huge radio set with detachable speakers immersed in the sand. Sound waves are shot out through the speakers, resulting in immediate particle-size reduction and complete separation of oil, sand, and liquids.

Experiments are now being conducted to assess economic factors involved in adding sound to existing separation equipment. The company has kept the Alberta Research Council informed of developments of their experiments.

Sonic Oil Separation, Ltd., was formed in conjunction with Canadian Engineering Surveys, Ltd. D. Rae Sutherland of Edmonton is president of both firms. Directors of Sonic are Dr. John Duby, Stuart S. Purvis, G. Max Ritchie, Fitzgerald, E. R. Robertson and N. Kuzio.

Another firm, Royalite Oil Co. of Calgary, currently is engaged in a $50-million project in the oil-sands area using another process. The Coulson process is being used by Royalite. It is based on the theory that centrifugal action will separate oil from the sand.

Schlumberger Picks Gillingham

WILLIAM J. GILLINGHAM, who joined Schlumberger Well Surveying Corp. in 1929, 5 years after its first electric-logging project in this county, has been named president of the company.

He was formerly executive vice president.

Gillingham succeeds Pierre Schlumberger, who said the change will allow him to devote full time to his duties as president of Schlumberger, Ltd. He had been president of the well surveying company since 1946.

World-wide Schlumberger operating companies were reorganized into Schlumberger, Ltd., in March. Schlumberger will continue as a director of Schlumberger Well Surveying.

Gillingham served as Louisiana division manager for the company and as vice president and general manager of its Venezuelan subsidiary before being named executive vice president in 1951. He became a director in 1954 and a director of Johnston Testers, Inc., last year.

—— *Industry* briefs

The first wildcat within the city limits of Mobile, Ala., has been spudded by Southwestern Oil & Refining Co., Corpus Christi. The wildcat, 1 Cora Miller and City of Mobile, is just inside the northwest city limits.

Ebro Oil Co., Inc., Longview, Tex., last week bought 30 wells in East Texas field in Gregg County, Longwood field in Harrison County, and Carthage field in Panola County. The properties have reserves of about 800,000 bbl. Sellers were W. E. Mitchell, Jr., Gladewater, Tex.; Max Clark and Tom Cook, Longview; and an Alabama group.

W. O. Davis, Jr., Ebro president, said the company soon will close another deal involving about 400,000 bbl. of oil reserves. The two deals will involve around $1,000,000.

Falcon Seaboard Drilling Co. has leased three Bethlehem MC-950 rigs from Williamson Well Service, Midland, for drilling in West Texas. With the three rigs, Falcon now has a total of 26 domestic rigs and 8 others in Venezuela.

Columbia Gas System, Inc., has begun a program to develop its estimated 3.5 trillion cubic feet of natural-gas reserves in southern Louisiana. Two subsidiaries, Preston Oil Co., an oil and gas-producing unit, and Columbia Gas Service Corp., have opened offices in Heymann Oil Center, Lafayette, La.

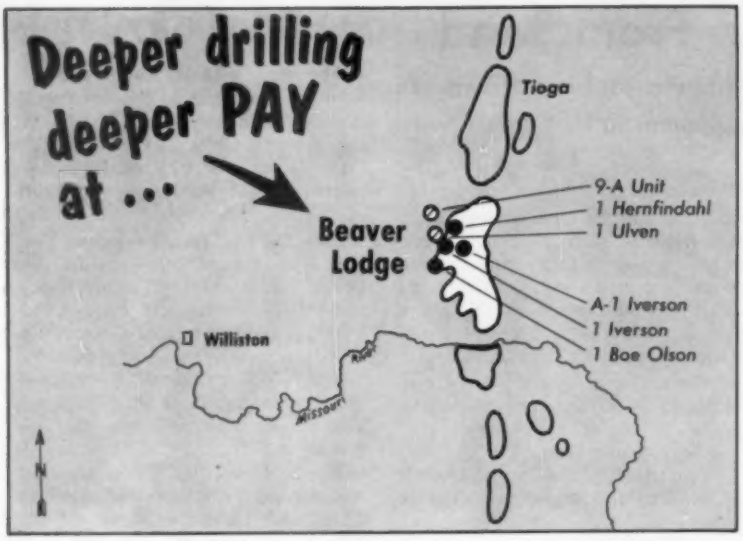
Kentucky's highest tribunal, the Court of Appeals, has ruled that the state cannot collect ad valorem taxes on approximately $7 million worth of property held by Standard Oil Co. of Kentucky in other states.

The levy, which has been in dispute for years, would be unconstitutional and void, the court said. Standard of Kentucky is the leading marketer in Florida, Georgia, Alabama, and Mississippi, as well as Kentucky.

Oil-industry spending for new plant and equipment will hit a new record high in 1957, it was estimated last week by the Commerce Department.

The department estimated that oil companies will have spent $3.5 billion this year to expand their facilities. That would be an increase of around $370 million over 1956.

The outlook for 1958 is less certain. The current uncertain state of business is having its effect on plans for further expansion.



Four Deep Williston Tests Hit

. . . to give North Dakota new pay zones in Silurian and Devonian. Development follows trend started at Outlook.

AMERADA PETROLEUM CORP. has smashed the North Dakota production depth record and given Beaver Lodge field new significance with four strikes below 11,000 ft.

All four successes have occurred since December 1. In the past, the 6-year-old Beaver Lodge, granddaddy of North Dakota fields, has produced oil from around 8,200 ft. Now it takes on renewed life with deeper oil pay.

Amerada will not produce the condensate at this time for lack of field processing facilities. It will produce the oil.

The record holder among the quartet of field wildcats is the 1 Hernfindahl-Kvam, producing in the Silurian at 11,714-44 ft. The new depth-record completion also is a Devonian producer at 10,266-10,474 ft. Silurian production was 182 bbl. of condensate per day, and the Devonian produced 465 bbl. of oil per day.

The other three Amerada dual producers:

. . . A-1 Iverson-Nelson Unit. The Silurian produced 160 bbl. of condensate per day at 11,499-11,568 ft. and the Devonian 394 bbl. of oil at 10,194-10,502 ft.

. . . 1 Iverson-Nelson Unit. Production was found at four sets of Silurian perforations, the deepest at 11,526-11,696 ft., flowing 162 bbl. condensate per day. The Devonian produced 351 bbl. at 10,145-10,460 ft.

. . . 1 Boe Olson Unit. The Silurian produced 360 bbl. of condensate per day at 11,372-11,584 ft., and the Devonian 351 bbl. at 10,300-70 ft.

Regular production at Beaver Lodge has been in the Madison-Mississippian. The original discovery well, completed in August 1951, actually had shows in the Silurian and Devonian, but not until this month were there any completions in the two deeper zones.

Amerada has been busy all this year digging deep in the field. The company set a drilling-depth record at 14,828 ft. with its 9-A Unit well, now inactive. One other well, in addition to the successful producers now being completed, is drilling below 13,352 ft. It's the 1 Ulven.

The Silurian and Devonian discoveries in northwestern North Dakota are part of the new era in Williston basin exploration. The Outlook success in northeastern Montana set off the deep play earlier this year.

The development at Beaver Lodge will lead to increased deep exploration in the old fields of the Nesson anticline, extending north and south of Beaver Lodge.

Utility Plans LPG Cavern

NORTHERN INDIANA Public Service Co. will begin work early next year on a 300,000-bbl. LPG underground storage cavern near La Porte, Ind., southeast of Chicago.

The $2½-million project will be one of the first ever built by a public utility. Most of the nation's other LPG underground storage facilities are operated by producing, refining, and petrochemical companies (OGJ, Oct. 14, p. 101).

Product for the new cavern will be shipped in by rail or truck and stored in hard rock 350 ft. below surface. It will be withdrawn when needed and blended with natural gas at NIPSCO gas-mixing plants.

North Texas Flood

planned for KMA. Additional recovery expected to hit 15,000,000 bbl.

SHELL OIL CO. and other operators are planning a major water-flood project for the southwest portion of KMA field in North Texas.

Engineers estimate that the flood, which will cover 4,800 acres, will result in recovery of an additional 15,000,000 bbl. of oil over a 20-year period.

The field, which is located in Wichita and Archer counties, was discovered in 1931. Since then, the portion to be flooded has produced about 21,000,000 bbl., or 25 per cent of the 84,000,000 bbl. of estimated oil in place.

By injecting water into the KMA sand, Shell expects to increase ultimate recovery to 37,800,000 bbl., or 45 per cent of the original oil in place.

Shell, which owns 39 per cent of the wells in the area involved, was named operator in an agreement signed with the other 44 companies operating in the area. The project has yet to be approved by royalty owners and the Texas Railroad Commission.

Five-spot pattern . . . Shell plans to use an irregular five-spot pattern involving 170 producing wells and 151 input wells. An estimated 350,000,000 bbl. of water will be injected into the sand, which is found at 3,800 ft.

This will not be the first secondary-recovery program for KMA. In 1939, operators joined in a pool-wide gas reinjection program. But engineers say this method has reached its effective limit.

Only 228 of the area's 272 wells are now on production. These wells are making a total of 500 bbl. of oil daily.

The water-flood program has been under consideration since 1953 when operators formed a cooperative group to study the possibility of such a project.

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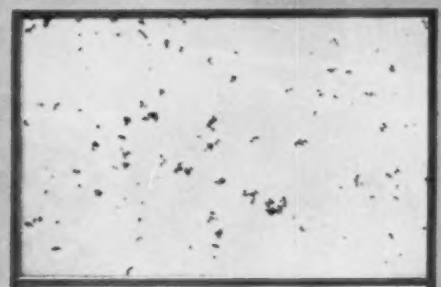

Above—Untreated fuel oil, after aging, (magnified 200X) showing typical sludge formation.

Below—Nalco treated... same fuel oil... same aging, showing sludge prevention.

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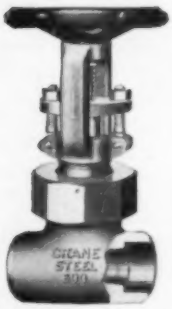

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Texas Producer-Pipeline Ruling Near

● Independents claim the majors refuse connections and then buy cheap foreign oil. Pipeliners say they need a market to add field connections.

A DECISION in the scrap between independent producers and major pipelines in Texas over lack of outlet for West Texas crude may come early next year.

The Texas Railroad Commission set oral argument on the issues for January 6 in Austin.

Unless unforeseen developments upset the apple cart, this should be the final formal step before decision in the hard-fought case, which has dragged on now for nearly a year.

Five independent-producer associations asked the commission last January to make a general investigation of common-carrier pipelines and crude purchasers in the state.

Importer tie-up . . . The independents charged that West Texas production has been "bottled up" by importing majors through their control of the common-carrier lines so they could import more cheap foreign oil. The majors accomplished this, the independents charged, by failing to enlarge capacity of trunk and gathering systems to take care of expanding new oil, by converting crude lines to products service without required authority, and by refusing to connect their systems to new wells.

They asked that the commission issue an order:

. . . Requiring common carriers to make connections along their systems.

. . . Forcing crude purchasers to pay the cost of gathering oil which must be trucked to market.

. . . Setting down distances and circumstances within which a carrier must connect to a producing well.

. . . Requiring connections by a carrier when the carrier is taking oil from other wells in the same field.

The petitioning associations are the Texas Independent Producers and Royalty Owners Association, North Texas Oil and Gas Association, West Central Texas Oil and Gas Association, East Texas Oil Association, and Panhandle Producers and Royalty Owners Association.

First hearings on the issue were held April 1-3. Producers used a dozen witnesses and nearly 50 exhibits in presenting their case. The pipelines got their turn May 13-15. The five associations filed a follow-up brief as required by the commission September 17. And the carriers filed reply briefs December 1.

Conflicting arguments . . . The producers back up their charges by pointing to more than 8,000 unconnected wells in the state, more than 6,000 of them in pools where other wells are connected. They said Texas had no unconnected wells 20 years ago, when imports were just beginning to become a problem.

Trucking of oil has shot up 637 per cent since 1948. And the producers say they are discriminated against unlawfully because they must pay the heavy trucking charges, while, in the case of neighboring wells connected to gathering lines, the shippers pay the pipeline gathering charges.

The pipelines' prime defense during the year was that the producers want market, not transport. They pointed out that common-carrier lines, like railroads, ship for anyone but do not buy what they ship. If a producer has a market and if the carrier is able to lay a line to gather the oil economically, the producer is never refused a connection.

The producers responded that this is an ingenious but illegal method of bouncing an unconnected producer back and forth from wall to wall like a handball. Common carriers are refusing to connect because their major-company owners and oil buyers don't want the oil, preferring imported oil.

The producers contend common carriers, like bus lines, should tie in all producing wells in their area of operations. If the return on investment isn't high enough as a result, the lines under the law may petition the Railroad Commission for a tariff increase.

Commission Authority Will Be Tested

WHAT POWER does the Texas Railroad Commission have in settling the producer-pipeline argument? That is the key question.

Can the commission order a common carrier to extend or expand its trunk or gathering system?

Can it order a common purchaser to buy oil from an unconnected well in a pool where the purchaser buys from other wells? And can it order the carrier to connect to such a well if the carrier serves others in the pool?

Can it force a carrier serving one field to enter and serve another neighboring pool with no previous pipeline connection? Could it then force the parent major purchaser to buy oil from the latter pool?

These and others are questions which the commission has been called upon to decide.

So far as can be determined, the commission, if it has any of these powers, has never exercised them. It has always maintained, for instance, that it cannot force a purchaser to buy oil he doesn't want.

The independent producers say, however, the commission has all of these powers under the Texas conservation statutes.

One law, Article 6049-A, Section 7, V.C.S., gives the commission power to order a common carrier to extend or enlarge its system if the extension or enlargement is:

. . . "Reasonable."

. . . "In the public interest."

. . . Not so expensive as to impair the carrier's duty to the public.

Section 11-D of the same article provides that the commission can determine, through inquiry into any field, whether any common purchaser is discriminating against any producer by withholding a pipeline connection. If the agency finds such discrimination, the section instructs it to order the carrier to grant relief by making any reasonable extension of its lines.

Still another section instructs the commission to prevent or stop unreasonable discrimination in favor of one pool as against another.

In the coming weeks, the commission must decide whether the cited statutes give it the authority to do what the producers ask. If it rules for the producers, oil purchasing and pipelining in Texas might undergo drastic change. Such a decision, however, undoubtedly would send the carriers to the courts to overthrow it.

Subsidence Row Flares

. . . over repressuring project to halt sinking in part of Wilmington field. Involved in feud are Long Beach City Council, harbor officials, and two engineering experts.

SOME FRAYED NERVES are beginning to show from a scramble to get a repressuring program under way in the subsiding Wilmington field at Long Beach, Calif.

This is the situation:

The Long Beach City Council is feuding with the Long Beach Board of Harbor Commissioners. Two of the country's top repressuring experts also are at odds on a flood plan for the sinking area.

Immediate bone of contention is a proposed 180,000 bbl. daily flood. The Long Beach Oil Development Co. wants to start the project right away on the south flank of the field. However, the company needs the city's approval before it can go ahead.

It has sought such permission twice through the harbor commissioners. The city council has rejected the idea both times.

Experts disagree . . . The LBOD-harbor commissioners' position is based on the recommendation of R. S. Earlougher, consulting engineer from Tulsa.

In support of the 180,000-bbl. flood, Earlougher said the project would help a 1,000,000-bbl. flood planned later for the entire field by:

. . . Providing valuable data from the small-scale operation.

. . . Getting early start on the problem with flooding on the field's flanks. This is important because it likely will take 5 years to get the bigger project started.

However, the city council's own expert—DeGolyer & MacNaughton—opposes the smaller flood.

The DeGolyer & MacNaughton position is that the small flood does not:

. . . Give city sufficient control.

. . . Fit in with plans for a 1,000,000-bbl. injection project.

Specifically, DeGolyer & MacNaughton advised that provisions for city-controlled subsidence-abatement measures be included in the 180,000-bbl. flood when and if it is ever given the go-ahead.

The latest effort by the harbor commission to get council approval of the 180,000-bbl. program touched off a flurry of hot words in the council chambers.

"It is deplorable that the board would go ahead with this kind of action," Mayor Raymond C. Kealer said. "They try to make themselves look good by making it appear we are blocking subsidence treatment."

"It makes us look bad when our own engineers can't get together," Councilman John F. Baker said.

"Lets send it back to them when they refer it to us again," Councilman D. Pat Ahern urged. And that's exactly what likely will happen.

Some action . . . While city agencies bickered, oil companies have pushed plans to form voluntary unit agreements as soon as possible.

Operators in fault Blocks 2 and 3 have formed one group. Those in Blocks 4, 5, and 6 have organized another. Lawyers from both groups have formed a legal-drafting committee to work on coordinated unit agreements.

Two other hurdles remain to be cleared.

A special city election is planned for early 1958 to amend the Long Beach charter to permit life-of-the-field unit agreements. Charter provisions now limit city leases or contracts to 25 years.

Efforts still are being made to get similar legislation through the legislature permitting the state to participate in voluntary unitization work. The state has a big interest in the field.

Navy hires expert . . . The Navy, meanwhile, has hired its consultant to study effects of subsidence on the Long Beach naval base. He is Graham B. Moody, president of the American Association of Petroleum Geologists. Moody in a preliminary report agreed with other opinions that oil production is responsible for land sinking in Wilmington field. He holds that a major repressuring program in all zones is the only way to halt the sinking.

Gas to Jump Sims Sand Output

SKELLY OIL CO is laying the groundwork for a huge secondary-recovery project in southern Oklahoma's Velma field.

The company hopes to boost oil recovery by more than 240,000,000 bbl. by injecting gas in the Sims sand, one of several producing formations in the big Stephens County pool.

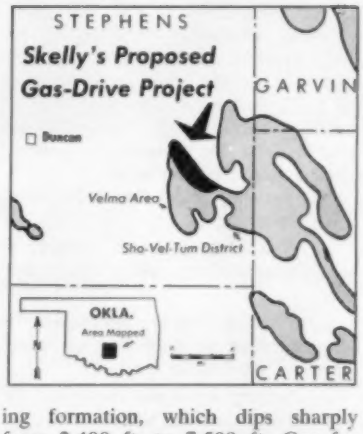
The repressuring program—the first for Velma—will be carried out on 3,694 acres, owned 72 per cent by Skelly. Velma pool is the company's largest oil reserve, and the project would be the largest secondary-recovery program operated by Skelly.

When Skelly discovered the field in 1944, original oil in place in the Sims sand was estimated at 776,000,000 bbl. Since then the zone has produced 70,000,000 bbl.

Skelly engineers have estimated primary recovery from the Sims at 141,000,000 bbl., or 18 per cent of the original oil in place. Gas repressuring would boost recovery to 49 per cent of oil in place, or 383,000,000 bbl.

Plans . . . Unitization of the area, which is a part of the Sho-Vel-Tum production district, will require ratification by the other 27 operators, and approval of at least 63 per cent of the royalty owners.

The company has not said what pattern would be used, except that injection will be at top of the producing formation, which dips sharply from 2,400 ft. to 7,500 ft. Gas for injection would come from Skelly's natural-gasoline plant at the town of Velma.



Since discovery of the pool 13 years ago, reservoir pressure in the Sims has dropped from 1,735 psi. to the present 500 psi. Skelly plans to maintain the pressure at that level.

The proposed gas-injection area includes 282 oil wells, of which 197 are owned by Skelly. Oil gravity averages 29°, and per-well allowable is currently 27 bbl. per day.

Besides the Sims sand, other producing horizons in the big field include the Permian, Hoxbar, Deese, Humphreys, Mississippian lime (Sycamore), Bromide, and Oil Creek.

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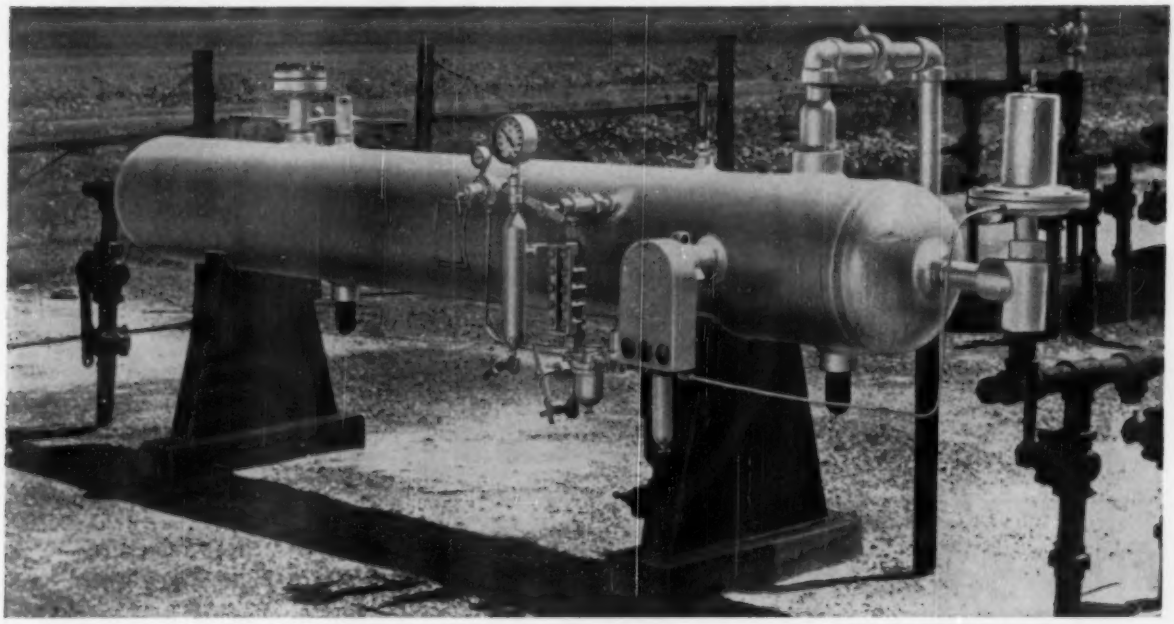

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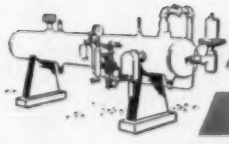

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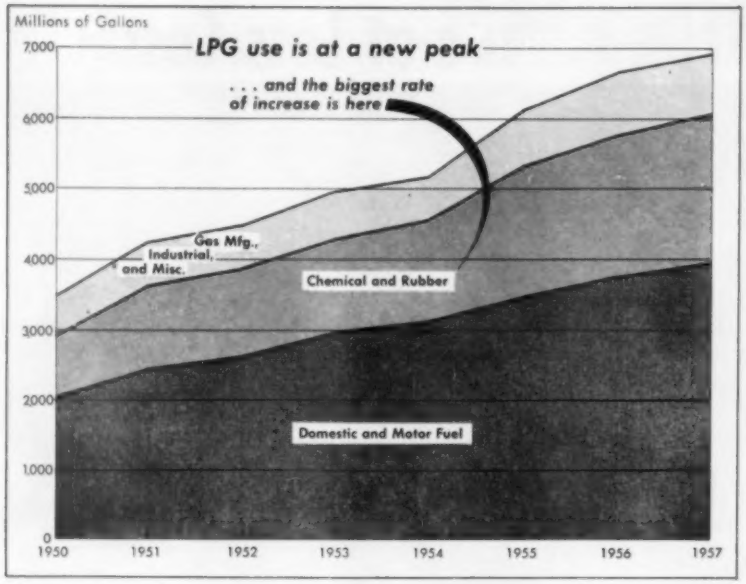

LPG Sets New Record

. . . and Phillips says still more markets are waiting to be developed. Sales increase 4.1 per cent this year.

DEMAND FOR LPG, which has tripled in the past 10 years, rose again this year, and Phillips Petroleum Co. predicts a still better year in 1958.

Phillips estimates industry sales of butane and propane at 6,907,700,000 gal. in 1957—an increase of 272,000,000 gal. over last year.

This 4.1 per cent increase is well below the 8.4 per cent gain chalked up last year and the 19.5 per cent jump 2 years ago. But Phillips considers it "impressive," since it "exceeds the estimated percentage increases in sales of all other petroleum products this year."

In its annual year-end study of LPG sales, Phillips points out that new production, transportation, and storage facilities helped keep pace with the higher demand this year. The industry built 32 new plants, boosting production by 1,200,000 gal. daily. New underground storage caverns this year increased total capacity to more than 1,400,000,000 gal. (OGJ, Oct. 14, p. 101).

Who's using LPG . . . Here's how Phillips breaks down 1957 LPG demand:

. . . Domestic and motor-fuel markets: 3,943,300,000 gal., up 4.5 per cent.

Motor-fuel use is expected to show the biggest gain, taking 834,500,000 gal., an increase of 7.9 per cent.

Sales of factory-equipped LPG farm tractors hit 15,500, topping last year's total by 27 per cent. This happened while gasoline-fueled farm-tractor production was dropping 7 per cent.

. . . Chemical and rubber manufacturing: 2,092,000,000 gal., up 5.2 per cent.

Sale of LPG as a raw material for making chemicals and chemical intermediates will total 1,665,500,000 gal., a gain of 6 per cent. Most of this increase, Phillips says, is due to the rapid growth in polyethylene capacity.

Rubber components required 426,500,000 gal. This is a gain of only 2 per cent over 1956. But the gain occurred while domestic consumption of synthetic rubber was off 8 per cent, due to a cut in inventories and a long strike at a major plant.

Gas utilities: 203,500,000 gal., a drop of 4.2 per cent. This is the only category in which a decrease occurred. Phillips attributes it to a decrease in expansion of natural-gas pipelines.

. . . Industrial and miscellaneous uses: 668,900,000 gal., up 1.4 per cent. Phillips says the increase was held down by "the leveling-off trend in industrial activity this year."

The outlook . . . Phillips sees a bright future for LPG in chemical manufacturing, rubber components, agriculture, and house heating.

By pushing summer load builders in the agricultural and asphalt fields, dealers will be in a better position to capture and expand the house-heating load, the survey points out.

"The swing to central heating was more pronounced this year and year-around weather conditioning with gas represents a huge potential market still to be tapped."

In its survey, Phillips refers to the use of LPG in secondary recovery as "a new aspect of storage" which could become an important factor in the LPG storage and supply picture.

"It is not known as yet what the recovery of LPG will be, and in most instances it will be necessary to reprocess it before it will be marketable as LPG," the company said.

Patent Awarded

to Du Pont for developing linear-type polyethylene

THE patent position on linear polyethylene has been thrown into confusion by new claims of Du Pont Co.

Du Pont has been issued a U. S. patent for basic research, stemming from laboratory work going back 10 years. The company claims this work led to development of several patented processes for making the new polyethylene.

This doesn't concern conventional high-pressure polyethylene but the linear type, which is longer chain material with higher density and greater strength and heat stability.

Phillips Petro'eum Co., Ziegler, and Standard Oil Co. (Ind.) have patents for catalytic processes for making this new polymer, and several licenses have been issued for manufacture.

The picture won't be resolved for some time to come because of the complexity of the process claims. Few opinions of Du Pont's chances are being expressed until close studies are made of its patent.

Phillips says the Du Pont patent "does not interfere with nor affect Phillips' patent applications which cover Phillips' low-pressure process utilizing Phillips' catalyst. The Du Pont patent is based on the old high-pressure process, which is entirely different from Phillips process."

Phillips does not believe its license position will be affected, or that the price of the new polymer made by its process will be more costly. Licensees are not involved. Solution of the controversy will merely determine to whom they should pay royalties.

Mission Taps White

as new president. Sharp to continue as board chairman

RICHARD E. WHITE

MISSION Manufacturing Co. last week promoted Richard E. White to its presidency.

White has been executive vice president since 1955. He succeeds Walter B. Sharp, who has been both president and chairman. Sharp will continue as board chairman.

White joined Mission after his graduation from Texas A. & M. College in 1938. He was appointed plant superintendent in 1942 and became production manager in 1946 after a stint in the Navy. White also served as works manager, and was general manager before his election as executive vice president 2 years ago.

He is currently serving as chairman of the Export Operations Committee of Petroleum Equipment Suppliers' Association.

Texas Allowable Unchanged

TEXAS will hold production steady at 12 days in January, leaving the allowable unchanged from October except for production from new wells.

The January allowable was set by the commission December 19 at 2,985,350 bbl. daily, down only 2,065 bbl. daily from the initial allowable for December and up 11,783 bbl. daily from the figure in effect December 7.

The action was in line with the recommendations of all but one major buyer, Sun Oil Co., which sought an 11-day schedule.

Pipeline briefs

Sinclair Pipe Line Co. will start next month on the second half of its new big-inch crude line from North Texas to Houston. Contracts were let last week to Lone Star Constructors, Inc., Dallas, for 143 miles of 20-in. from Teague to near Houston, and the final 6 miles to Golightly Construction Corp., Houston. The project is to be completed in June.

Sinclair completed the first section, 152 miles of 18-in. from Jacksboro to Teague, in April 1956. The project will modernize the company's system by replacing outmoded multiple 8-in. lines.

Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y., has completed a 47½-mile, 10-in. gas line from Albany to Kingston, N. Y. The project was handled by Williams-Austin Construction Corp., Pittsburgh.

Gulf Interstate Gas Co. plans to increase its take from Jefferson Davis, Vermilion, and Cameron parishes in Louisiana by 44,000,000 cu. ft. per day. It has sought FPC authority to build 10 miles of 20-in., looping a 12-in. lateral, and 3 miles of 6-in. looping of an existing 6-in. supply line. Cost of the expansion will be $730,000.

Saskatchewan Power Corp. has started up the province's first natural-gas compressor station, located at Coleville, to pump gas through its northern system. Fish Engineering Corp. designed and built the $1,000,000 station, which will make more gas available in the Saskatoon, Princc Alberta, and North Battleford areas.

Tennessee Gas Transmission Co. will seek to list its common stock for trading on the New York, Midwest, and Pacific Coast stock exchanges in March. The board of directors also has authorized sale of 1,000,000 additional shares of common stock early next year and distribution to stockholders of one new share for each five held.

Texaco-Cities Service Pipe Line Co. has repaired a break in its old 12-in. crude line at the Neosho River crossing near Chetopa, Kans. The system was built almost 30 years ago from Cushing, Okla., to East Chicago, Ind. O. R. Burden Construction Corp., Tulsa, worked around the clock to minimize loss of oil.

A temporary bypass was completed about a week after the break December 6. A permanent line is now being laid in the river bed, which is solid rock. The temporary line will be left in place, giving the company insurance in the event of a future break.

Phillips Petroleum Co. has applied with the Texas Railroad Commission to install and operate an automatic custody transfer system on its University Andrews lease in Embar El'enburger field of Andrews County, West Texas. A Phillips spokesman told the commission the proposed LACT system is identical to one already approved for a Phillips lease in Emperor field of Winkler County. The system, of the positive-dump type rather than positive-displacement meters, will deliver the oil to Phillips Pipeline Co.

Cherokee Pipe Line Co., owned by Continental Oil Co. and Cities Service Oil Co., plans to build a 78-mile, 12-in. products line from the companies' Ponca City refineries to Tulsa next year. Bids have been invited for the project, which is to begin sometime in February. The new line will end at the Glenpool terminal.

Columbia Gas System, Inc., has formed a new subsidiary, Columbia Hydrocarbon Corp., which will own and operate a fractionation plant at Si'oam, Ky., and a 35-mile pipeline. The pipeline will transport a mixed stream of hydrocarbons extracted from natural gas at Kenova, W. Va. Columbia's United Fuel Gas Co. is building an extraction plant at Kenova. The Siloam plant ultimately will produce 206.5 million gallons annually of natural-gas liquids.

Also for Pipeliners . . .

IN THE NEWS: FPC intervenes in case testing right of Kansas to fix minimum price for gas at wellhead (p. 28) . . . Phillips hearings end, but end of case still is far away (p. 31) . . . British build line to handle methane soon to come by ship (p. 33) . . . Ruling near in Texas producer-pipeline dispute (p. 39) . . . El Paso Natural signs up big batch of gas reserves in Aneth field which Transwestern Pipeline had counted on (p. 45).

PLUS THESE TECHNICAL REPORTS: Performance of new 890-960 mc. communication system (p. 70) . . . Pipeline construction report (p. 91).

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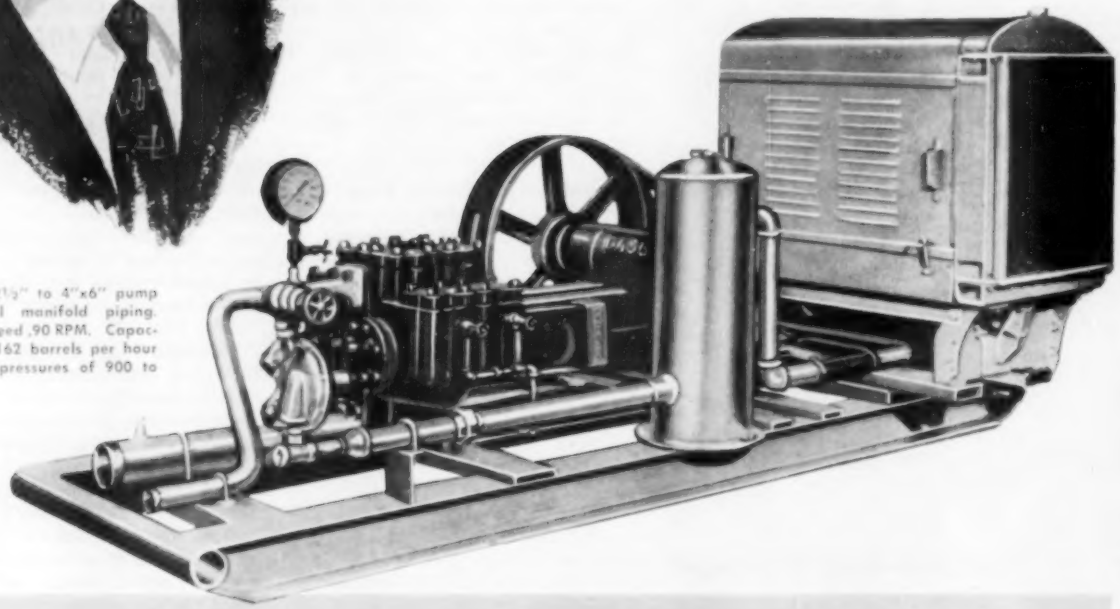

Fig. 1849—2½" to 4"x6" pump with special manifold piping. Maximum speed 90 RPM. Capacities, 59 to 162 barrels per hour at working pressures of 900 to 350 PSI.

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Aneth Gas Goes to El Paso

. . . and Transwestern loses out in bid for big reserves. New supply helps firm up El Paso's plans for expansion.

EL PASO NATURAL GAS Co. has signed up the big Aneth field gas package which Transwestern Pipeline Co. had originally counted on for its proposed line to California.

And El Paso will pay producers an excellent price—20 cents an M.c.f. for residue gas the first 5 years, and 1-cent escalation for each 5 years thereafter. There is also a provision for price redetermination every 5 years.

El Paso figures Aneth reserves of oil-well gas at 677.6 billion cubic feet. Superior Oil Co. and The Texas Co. have not committed their acreage, although Superior has indicated it will. The other producer contracts are for casinghead gas which El Paso will process in a plant it proposes to build. Texaco is reported interested in building its own gasoline plant.

The Aneth reserves are the major part of a gas supply supporting the latest expansion plan which El Paso has filed with the Federal Power Commission. Other fields in southeastern Utah and a few in northeastern Arizona also will be connected to lines planned in the expansion.

El Paso vs. Transwestern . . . El Paso had a big advantage in going after Aneth reserves.

It had an operating system in nearby San Juan basin and an immediate market waiting. Transwestern is a new venture, with the FPC to hurdle and a new market to crack, the same one which now buys all its out-of-state gas from El Paso. And time was of the essence. Wells are already on production filling the 650-mile, 16-in. Four Corners Pipe Line to Los Angeles. Gas produced along with the oil will be flared until the field is connected to a gas pipeline. The quickest outlet was both good business and good conservation.

However, loss of this supply does not kill the Transwestern line, which is backed by Warren Petroleum Corp., a Gulf Oil Corp. subsidiary; Monterey Oil Co.; and J. R. Butler and associates, Houston consulting engineers.

Transwestern plans a 1,250-mile line, up to 30 in. in diameter, from Southwest Texas to California. It will be based primarily on reserves in Pecos and Terrell counties, Texas. This proposed line, which hasn't yet been brought before FPC, would run within 100 to 200 miles of Aneth, placing Transwestern in a good spot to compete for future reserves developed in this hot new area with great potential. It would naturally have the inside track for gas found on Gulf acreage.

El Paso plans . . . Here's what El Paso proposes in its FPC application:

. . . 79 miles of 16 to 20-in. main line, with capacity of 115,000,000 cu. ft. daily, from Aneth to its 24-in. San Juan main line in northwestern New Mexico.

. . . A natural-gasoline plant with capacity of 100,000,000 cu. ft. daily in Aneth.

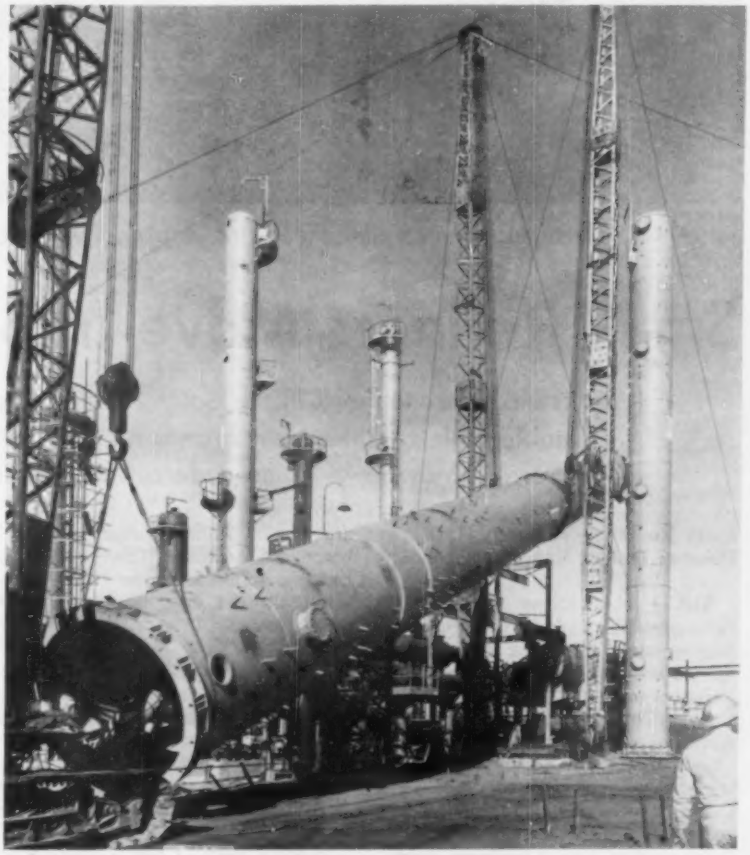
. . . A dehydration plant to process 80,000,000 cu. ft. daily.

. . . 87 miles of 4 to 30-in. gathering lines.

. . . 27,900 hp. in compression.

The project would cost $26,277,000.

Besides Aneth, El Paso would take gas from Boundary Butte, Desert Creek, Gothic Mesa, Cahone Mesa, Ratherford, Bita Peak, Ismay, and White Mesa. The projects will be built in 1958 if FPC approves.



Tower Swings in Place at Tulsa Plant

THE TALLEST refinery vessel ever installed in Oklahoma has been set at D-X Sunray Oil Co.'s 75,000-bbl. Tulsa refinery.

The difficult installation of the deisobutanizer tower took place in a high wind, and the unit cleared an adjacent tower by inches (photo). Workmen breathed easier when the job was finished: It took place on Friday the 13th (of December).

The new tower is part of a 2,500-bbl. butane isomerization unit going in at the Tulsa plant. It is 163 ft., 8 in. tall and weighs 100 tons. A davit atop the tower adds an additional 9 ft. to the over-all height.

The isomerization unit is part of a $10-million expansion program to be completed next April. Refinery Engineering Co. of Tulsa has the prime contract for the entire program.

New brand names like these are popping up throughout the South, where . . .

Small Refiners Move Into Marketing

Trend is pronounced in the South, where independents are looking for more stable outlets. Three new brands hit the market in the past year, and others are relatively new. Some undercut majors, some don't.

Larry Resen
Houston District Editor

SUCH NAMES as "Star Fire," "Platinum-Plus," and "Bay" are appearing more and more on southern service station pumps.

Independent refiners are moving further into the rough-and-tumble world of gasoline marketing because of uncertainty in depending entirely on wholesaling their products.

Major companies are buying less from independent refiners. The refined-product market has been sloppy, and soft prices are making it tough on refiners generally.

Other adverse factors are price wars and the sagging demand for jet fuel and avgas. Some refinery units have been forced to shut down.

Companies taking the plunge into southern marketing this year include Eastern States Petroleum & Chemical Corp. ("Star Fire"); Texas Gas Corp. ("Platinum-Plus"); and Bay Petroleum Corp. ("Bay").

Within the past 3 years two other newcomers moving into the retail field are the "Amlico" and "Ingram" brands of American Liberty Oil Co. and Ingram Oil & Refinery Co. American Petrofina, Inc., has since taken over American Liberty.

The beginnings . . . Entry of the independent refiner into the southern marketing field with their own brand products is not novel. Cosden Petroleum Corp. actually began retailing in a limited way in 1930, shortly after its Big Spring, Tex., refinery was built.

And Crown Central Petroleum Corp., an eastern company with a refinery in Houston, has sold at retail in Houston for several years. Clark Oil & Refining Co., with New Orleans and Chicago refineries, also has marketed for some years although concentrating in the Midwest.

Bay Petroleum also has been an active marketer for some time in the western states. Only recently, however, has it started marketing products from its Chalmette, La., refinery in the Gulf Coast area.

Generally, however, independent refiners have relied on wholesale outlets for their products. They have sold both to major companies and other independents on a contract basis or have sold in the spot market.

A few have held dual roles, selling products wholesale to jobbers and then competing with them on the retail level. By the same token, most of the majors sell products to independent marketers which, in turn, compete with the majors' retail outlets.

No set pattern is emerging as independent refiners enter marketing. Some market a third "superpremium" grade; some compete with the majors on price; some compete with the independent stations; and some compete with both.

The newcomers . . . The newest entry into the marketing field is Eastern States' "Star Fire" brand, confined so far to the Texas Gulf Coast. The company sells a superpremium grade of more than 100 octane and sells at about 2 cents per gallon under prevailing major prices. Refining ca-

pacity of Eastern States at Houston is 65,000 bbl. daily.

Texas Gas sells its gasoline in the Texas Gulf Coast area also. It owns no retail outlets but sells to both branded and unbranded dealers. The superpremium gasoline is 100-plus octane "Platinum-Plus." Most retailers sell at the independent price level. Texas Gas has a 5,000-bbl. refinery at Winnie, Tex.

Bay Petroleum, owned by Tennessee Gas Transmission Co., is building a southern retail market both by buying other companies and developing its own brand name.

In August it took over Speed Products Co. and Citizens Oil & Gas Co. of Tallahassee, Fla. This included 75 Speed stations in northern Florida, Georgia, and Alabama. Bay a'so bought four stations in New Orleans and operates two under the Speed brand and two under the Bay brand.

The Speed stations operate at the independent price level, while the Bay stations handle superpremium grade at the major level. Bay's Chalmette plant has a 23,500-bbl. capacity.

Older hands . . . Ingram Oil, with a 15,000-bbl. refinery at New Orleans, has 21 independent-price stations in Alabama, Florida, Mississippi, Tennessee, and Louisiana. It has no third grade.

American Petrofina sells its Amlico products through its own and independent stations. It operates in most of Texas, and parts of Louisiana, Arkansas, Oklahoma, and New Mexico. Generally the stations sell at below-major prices. The company has a 30,000-bbl. plant at Mount Pleasant.

Cosden operates generally through jobbers and serves about 450 stations in parts of Texas and New Mexico. It owns a number of stations in Big Spring. The price varies—sometimes at the major level, sometimes under it. There is no third grade. Cosden's main refinery is a 30,000-bbl. plant at Big Spring.

New Pontchartrain Gas Line

SHELL OIL CO. has announced plans for a pipeline to move gas from its new field underlying Lake Pontchartrain to its nearby Norco, La., refinery.

The line will provide the first outlet for gas in West Pontchartrain Block 41 field, discovered in 1956. Shell now has four shut-in gas wells in the field, which is located about 15 miles from downtown New Orleans.

The 6-in. line, about 9 miles long, will have a design capacity of 15,000,000 cu. ft. per day.

Processing briefs

American Cyanamid Co. has joined Koninklijke Swavelsuurfabrieken VH Ketjen N.V. of Amsterdam, Holland, in building a new platinum reforming catalyst plant at Amsterdam. Each will invest $1,200,000 in the new facilities.

A new class of greases, called Shell ETR for extreme temperature range, has been introduced by Shell Oil Co. for use in missiles and supersonic planes. They will stand up under temperatures of 600° and lubricate metal parts rotating up to 30,000 r.p.m. The greases contain an organic vat dye to thicken and improve heat stability and gelling efficiency.

Celanese Corp. of America and National Lead Co. have teamed up for research in new plastics and fibers. The work revolves around new catalysts, particularly organo - titanium compounds which show interesting polymerization properties. These and other catalysts under development will be used for synthesis of polypropylene, polystyrene, and other new polymer types of controlled molecular structure.

Commerce Oil Refining Corp. last week filed a registration statement with SEC covering a proposed public offering of $25,000,000 first mortgage bonds, $20,000,000 subordinated debentures, and 3,000,000 shares of common stock. Lehman Brothers will manage the underwriting.

This is the final kickoff for Commerce's long-extended plans to build a 40,000-bbl. refinery at Jamestown, R. I. Fluor Corp., Ltd., has the contract to build the plant. Gulf Oil Corp. will supply crude and purchase products for New England distribution.

Atlantic Refining Co., operator, has completed a new jointly owned natural-gasoline plant in Block 31 field of Crane County, West Texas. The plant is processing roughly 23,000,000 cu. ft. of gas a day and producing about 104,000 gal. of natural-gas liquids. Residue gas goes back into the Devonian reservoir to further the high-pressure gas-injection program launched by Atlantic in 1949. Other owners of the new plant are Continental Oil Co., Champlin Oil & Refining Co., and Phillips Petroleum Co.

Esso Standard Oil Co. has contracted for a 10,000-bbl. per day sulfuric acid alkylation unit at its Baton Rouge refinery. It is a duplicate of the unit now nearing completion at Bayway refinery, Linden, N. J. Foster Wheeler Corp. has the construction contract. Esso Research & Engineering Co. designed the process, which will be operated for motor alkylate.

Consumers' Co-operative Refineries, Ltd., will build a coking unit at its Regina refinery. Work on the $1,300,000 unit will start in January. It will have a 3,000-bbl. throughput of residual oil and produce 145 tons of coke per day and 70,000 gal. of other products.

Pure Oil Co. is increasing capacity of its natural-gasoline plant in Colorado's Adena field from 20 million to 25 million cubic feet of gas daily. The first of three new compressors that will be added at the plant is being installed. The other two compressors will be installed within 60 days.

Lake Charles Chemical Corp. has completed a $6,250,000 coking unit which will be operated by Continental Oil Co. as an integral part of its Lake Charles, La., refinery. The unit will produce approximately 85,000 tons of coke annually for industrial use and 4,200 bbl. daily of refinery stock for manufacturing motor gasoline.

Also for Refiners . . .

IN THE NEWS: Feeling persists that crude prices generally will remain firm despite cuts cropping up (p. 27) . . . Imports reach new low under voluntary control program (p. 32) . . . Canadian researcher claims highly pitched sound waves will jar crude from Athabasca sands (p. 35) . . . Demand for LPG rises again this year with another good year in prospect for 1958 (p. 42) . . . Du Pont is awarded patent for developing linear polyethylene. Rights of other claimants thrown into confusion (p. 42) . . . Small refiners are moving into marketing, particularly in the South (p. 46) . . . El Paso Natural Gas Products has completed new refinery near Gallup, N. M. (p. 50) . . . OCAW calls January meeting to study shorter work week (p. 50) .

PLUS THESE TECHNICAL REPORTS: Catalyst erosion in cat crackers (p. 62) . . . Cost projector slide rule speeds estimates (p. 69) .

COMMISSIONERS Wilburn Cartwright (left), Ray C. Jones, chairman, and Harold Freeman hear testimony in the Gulf contempt-citation case. Gov. Raymond Gary's special attorney, Charles R. Nesbitt, checks the records of a court reporter.

Gulf Defends Itself

. . . in test case on Oklahoma allowable order. Appeal of commission's ruling expected on constitutional issue.

THE OKLAHOMA Corporation Commission and Gulf Oil Corp. wrote their respective records last week on one of the basic issues involving state regulation of the oil industry: Whether a regulatory body can require a crude purchaser to get special permission before buying less than its allowable.

If the commission finds Gulf guilty of contempt of an allowable order, Gulf will appeal to the state and federal courts on constitutionality of the order.

In 4 days of testimony at Oklahoma City last week Gulf presented its defense, and the commission staff also put its case into the record. Results from any appeal will not be known for months.

Gulf's position . . . Gulf based its defense on the contention that the commission, in trying to force a purchaser to buy its full allowable unless granted an exception, is treading on territory of the federal Government. Crude buying is interstate business and a surplus market in other states affects buying in Oklahoma.

Gulf attorneys argued also that Gulf "is on trial as an importer" and that statements of Oklahoma Gov. Raymond Gary indicate the commission's contempt citation was issued because of imports. The commission refused to let Gary's remarks be entered into the record. and Gulf said it would challenge the ruling on appeal.

Gulf also charged the allowable order violates international agreements. Wortham Davenport, a Caracas attorney appearing as a Gulf witness, testified that the commission order violates trade agreements with Venezuela because it could, if carried far enough, result in a reduction of imports.

No effort was made by Gulf to deny it had prorated purchases 20 per cent in August, but it sought to show that the affected producers were able to market their oil.

One Gulf official testified his company had excessive stocks and could not take the full allowable without creating waste.

Commission view . . . Commission Chairman Ray C. Jones has taken the position the commission is not trying to force a company to take more oil than it can handle but to require the company to obtain permission before cutting below the allowable order. This is needed to protect correlative rights and prevent waste.

The Oklahoma case is the first of its kind involving state regulation and is being watched closely. The crowd at last week's hearing was smaller than expected—about 50 persons at a session.

The hearings were conducted without rancor, but attorneys clashed often on legal points. Governor Gary had a special attorney on hand to represent the state.

San Juan Allowable

may be cut by New Mexico until pipeline flow starts.

THE NEW MEXICO Oil Conservation Commission last week adopted a 37-bbl.-daily allowable for southeastern New Mexico fields.

It took under advisement a recommendation that the allowable in the San Juan basin be cut from 28 bbl. to a maximum of 9 or 10 bbl. for January.

Commission Engineer Van Nutter recommended the sharp slash for northwestern production. He said the market for oil from the San Juan basin "has gone to pieces because the incomplete Four Corners pipeline being built to the West Coast is virtually filled." The allowable in southeastern New Mexico remains at the record low set for September.

Shell Pipeline Corp., which is building the 750-mile Four Corners system, has been pumping in oil to replace water used for testing for several weeks. Capacity of the trunk and its gathering lines and working storage is 1,020,000 bbl. The line is scheduled for completion in February, after which, Nutter thinks, the market for San Juan basin oil will improve.

Oil-Shale Acreage Optioned

LEASE OPTIONS on 18,000 acres of oil-shale land in Uintah County, Utah, have been taken by Petro-Atlas Corp., Tulsa, a subsidiary of Floyd B. Odlum's giant Atlas Corp.

Dale Snow, chairman of Petro-Atlas, said purchase price will be 25 cents an acre if the options are approved by the Utah Land Board. Snow said the company has no immediate plans for exploration or development of the acreage. The company has an interest in other oil-shale lands through stock ownership in other firms.

In another deal, National Farmers Union Exploration Co., Denver, recently signed a contract with the land board for leases on 15,000 acres in Uintah County.

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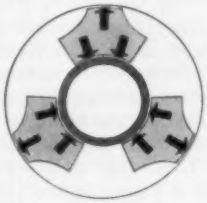

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El Paso Completes Plant

. . . in northwestern New Mexico. It's the company's fourth and largest refinery, boosting capacity to 17,500 bbl.

EL PASO NATURAL Gas Products Co. has placed its new 8,000-bbl. Ciniza refinery on stream. The plant, 10 miles east of Gallup, N. M., is charging crude at the rate of about 6,500 bbl. daily.

All units are on stream except a 750-bbl. hydrofluoric acid alkylation unit which is schedued to start up January 1.

A 1,600-bbl. fluid catalytic cracking unit and a 2,000-bbl. vacuum distillation unit began operating last week. Going into operation earlier were a 6,500-bbl. crude distillation unit and a 3,000-bbl. Platformer.

For the present, the $10,000,000 refinery is marketing solely in the Four Corners area. El Paso Natural Gas Products has several new service stations handling El Paso brand products in this area and is building more.

However, the company is expected to expand its marketing sphere soon to include Albuquerque and new areas in Texas and Arizona.

The plant . . . Process engineering has been handled by Universal Oil Products Co., and engineering and construction by Southwestern Engineering Co. of Los Angeles.

The plant site is on grounds adjacent to El Paso Natural Gas Co.'s big Wingate fractionating plant. The refinery will take butane and natural-gasoline raw material through short lines from the fractionating plant.

The crude supply also will come from Four Corners fields. El Paso Natural Gas Products bought a 96-mile, 6-in. products line from its parent, El Paso Natural Gas Co., which connected the Wingate plant to the Blanco gasoline plant near Farmington, N. M. This line was converted to crude service, and an extensive gathering system was built to tie into it.

Plant design is such that charge capacity can be hiked to 13,000 bbl. daily with a relatively small investment, C. L. Moore, company vice president and general manager, said.

Products at the new refinery will include regular and premium gasoline, kerosine, diesel fuel, distillates, and fuel oil.

Plant facilities insure a good competitive position in the octane race. The alkylation unit, for instance, will be used solely for upgrading motor fuel. The refinery, at least for the present, will manufacture no aviation gasoline.

The El Paso Natural Gas Products plant is one of the most colorful in the nation. All process vessels are painted white, with storage tanks in various pastel shades of green, yellow, purple, pink, and other colors. The refinery is within easy viewing range of motorists on U. S. Highway 66.

Capacity climbing . . . The Ciniza refinery increases El Paso Natural Gas Products' total refining capacity to 17,500 bbl. daily. The company operates three other plants with a combined capacity of about 9,500 bbl. daily at Prewitt, Brickland, and Bloomfield, all in New Mexico.

Capacity will be kicked up to about 24,000 bbl. daily next year when the company completes another new refinery now under construction at Odessa, Tex. This plant, a near twin to the Ciniza facility, is going up on a site adjoining styrene and butadiene facilities operated by firms in which El Paso has controlling interest.

This plant, too, will be in a good competitive position so far as octane is concerned. Available as raw material will be high-octane byproducts from the styrene and butadiene operations as well as plentiful crude supplies.

Union to Study Shorter Week

POSSIBILITY of shortening the work week for organized workers in the oil and chemical industries will be discussed in Denver early in the new year by staff members of the Oil, Chemical and Atomic Workers International Union.

The union staff meeting has been called for January 6 and will continue for a week.

Other issues on the program: The 1958 wage goals, new organizing and collective-bargaining techniques, and numerous intraunion matters.

Men attending the conference will be 140 OCAW staff workers and officials, including the organization's 16 district directors.

Union directors recently were ordered by OCAW President O. A. Knight to survey the prospects of layoffs resulting from automation, installation of new equipment, and "a general softening of business conditions." The directors were instructed to report their findings at a meeting of the OCAW advisory board. This meeting will be held in conjunction with the staff get-together next month.

Long-range policy . . . Any decisions reached on working hours and 1958 wage goals must obtain final approval from OCAW's 52-member bargaining policy committee.

It annually decrees mandatory contract demands to be sought by negotiators for the union's 200,000 members. This committee did not hold its customary fall meeting this year to set bargaining goals. But it is expected to be called into session by Knight soon after the January staff meeting.

There are indications a shorter work week may not be a prescribed issue in 1958.

A union spokesman described it as a long-range project and said it will "not necessarily be a bargaining issue" next year. However, the recent AFL-CIO convention went on record unanimously favoring a reduced number of working hours and sizable wage boosts in 1958. OCAW is affiliated with the AFL-CIO, and Knight is a vice president of the organization. As such, he had a commanding voice in shaping that policy.

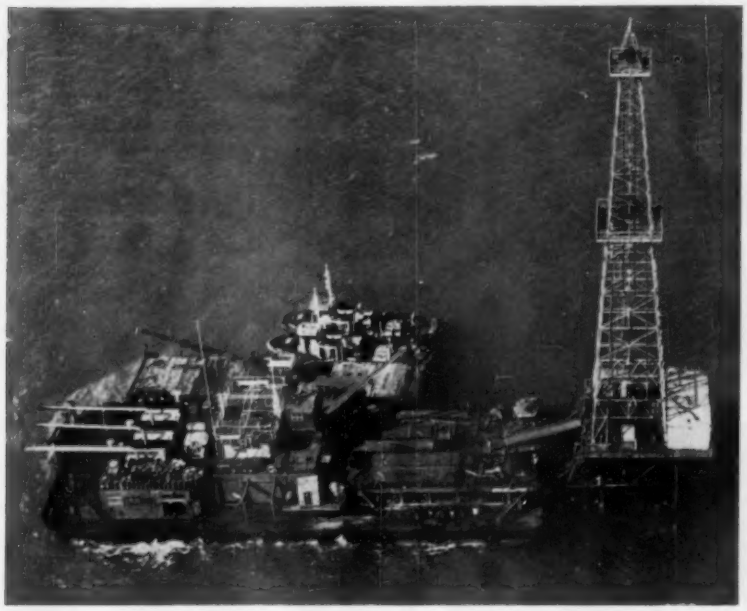
The wage policy . . . One thing is certain. There will be no 1958 wage moratorium in the oil industry, where OCAW has 105,000 members.

A suggestion that all unions forego wage increases next year was made at the AFL-CIO convention by President Richard J. Gray of the Building and Construction Trades Union.

OCAW policy is that high wages are good for the country's economy because they create mass purchasing power to buy up production.

The OCAW in Canada already is seeking a 1958 wage increase of 8 per cent, with a minimum of 18 cents an hour, for the union's approximately 15,000 members.

Whether this pattern will cross the United States border is problematical. Wages in the Canadian oil industry consistently have lagged behind U. S. levels, putting Canadian negotiators in the position of continually trying to catch up with American standards. The average oil wage in Canada is about $2.40 per hour, compared with $2.70 in the U. S.



"Queen Mary" finds more offshore oil for Aramco. Success means . . .

A New Role for Ancient Persian Gulf

BRACKISH, steaming, and fetid, the Persian Gulf has been important in modern times primarily as a tanker route to some of the world's biggest oil-producing fields.

Now, the gulf is assuming a new importance all its own. Instead of a mere shipping route for oil, the gulf shows promise of becoming a source for crude that could rival the fabulous fields on its surrounding shores. The big oil search emphasis in the Middle East today is on offshore drilling, most of it in Persian Gulf waters.

Last week Arabian American Oil Co. gave that emphasis another shove toward a concentrated rush to marine drilling. Aramco established its second offshore oil field in the gulf.

The first wildcat drilled by Aramco to test a structure 8 miles off Saudi Arabia in Manifa Bay is going to be a commercial producer. The well hasn't been completed yet, but a 47-ft. section below 8,747 ft. is productive. The interval has been tentatively identified as the "A" member of the Arab zone.

Aramco gave no flow figures of its drill-stem test, but said that gas reached the surface in 3 minutes and 28°-gravity sour crude was at the surface in 20 minutes. Coring is now under way in the Arab zone below the interval tested.

The company said the Sulaiy limestone encountered just above the anhydrite cap rock of the Arab zone had oil shows also. These have not been tested.

The Manifa structure was located by Aramco seismic and core hole work several years ago, but it was not tested by the drill until this fall. The company moved the "Queen Mary," its drilling barge 20 miles south from Safaniya field late in September to drill the test (OGJ, Oct. 14, p. 121).

Aramco originally planned to test the Bahrain and Zubair sands at Manifa. Both produce at Safaniya. Both were dry at Manifa (OGJ, Nov. 11, p. 133). The Bahrain and Zubair are both Cretaceous sandstones. They furnish the only sandstone production in Saudi Arabia at Safaniya.

The Jurassic limestone Arab zone, which Aramco is now testing 2,200 ft. deeper than Safaniya's deepest productive zone, produces in all Saudi Arabia's fields on land.

The Manifa structure is 20 miles south of the existing limit of Safaniya field. It is about halfway between Safaniya and the company's new Khursaniyah field, which is on land.

Safaniya pipeline to expand . . . Safaniya field went on production in April when a new 137-mile, 22-in. pipeline linking it to the Ras Tanura refinery and terminal was opened.

The initial output of the field, probably the world's largest offshore, was 50,000 bbl. daily. By the end of November the field's 26 wells had produced an average of 78,350 bbl. daily. This will be stepped up to 175,000 bbl. daily by the middle of next year.

Aramco plans to start looping the new 22-in. crude line next month. The first addition to the system will be 54 miles of 30-in. pipe. Another 63.3 miles of 30 and 32-in. pipe will be added by 1960 to bring Khursaniyah production into the system. The Khursaniyah discovery was drilled almost within sight of the line while pipe was still being laid to open up Safaniya.

If the new offshore discovery at Manifa proves to be in the same class as the 70,000-acre underwater field at Safaniya, Aramco may be doing even more looping on the new pipeline system. The Manifa field is only about 15 miles east of the Safaniya-Ras Tanura crude line.

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Russia Aids Egypt

in search for oil. Blocks lie on either side of Suez Gulf.

WHEN EGYPT starts its exploration program in the Red Sea and Sinai Desert areas, it will be the second free-world government to undertake prospecting on its own hook with the fine hand of Russia in the background.

Plans for exploration work on 61 blocks in the Red Sea and Sinai Desert areas have developed fast in the wake of the $175-million aid agreement negotiated with Russia. Some of this aid is believed earmarked for the purchase of Communist-made exploration equipment.

A new company, General Petroleum Co., was set up by the government to carry out the program. It is expected to buy equipment in western Europe, as well as from Russia. Necessary personnel also will be hired abroad.

The acreage lies on either side of the Gulf of Suez in the vicinity of old producing concessions held by Anglo-Egyptian Oilfields, Ltd., and Socony Mobil Oil Co., Inc. The companies have had bids in for the blocks for 10 years.

Under the new arrangement, General Petroleum will relinquish one-fourth of the blocks after 3 years. It can keep 10 exploration blocks after 6 years, plus any blocks with commercial production.

India was the first government to begin its own exploration program with the aid of the Soviets. Romania, a Soviet satellite, has advised India on its program in Punjab. A Romanian crew using Communist-built equipment is drilling a well at Jawalamukhi in the Kangra Valley.

Finland's New Plant

shows top-notch performance. Runs exceed capacity.

FINLAND IS PLEASED as punch over its new 16,500-bbl. refinery at Naantali, near the southwestern port of Turku.

Neste Oy, controlled by the government, put out a glowing report on the project. It said the refinery's performance is as good as any other project of its size outside the United States in recent years.

The company said the plant, the world's northernmost, is regularly running 10 to 15 per cent over rated capacity. Specification products were coming out 6 to 7 weeks after the refinery was put in operation this summer.

The plant reached 100 per cent capacity exactly 2 years after construction began. Over-all completion time was less than 24 months after a building site was tied down. Some of the work was carried on in weather ranging down to 40° F. below zero.

Lummus Co. of New York designed the plant with enough flexibility to handle a variety of crudes. Neste Oy currently is running a mixture of crudes from the Middle East and from the Tuimaza, Ural region of Russia.

Lirik Oil Moving

in new Stanvac tanker fleet from Central Sumatra region.

STANDARD-VACUUM Oil Co. has checked off another part of its $80-million expansion program in Indonesia as complete.

The company last week opened its new Lirik field in Central Sumatra to commercial production.

Regular deliveries began when a river tanker, the Stanvac Diirak, took on 28,566 bbl. of crude at Buatan terminal of the 88-mile, 8-in. Lirik pipeline.

Later the Stanvac Tankhaven, second of the specially designed fleet of river ships, called at Buatan. It took 30,000 bbl. down the Siak River. The run to Sungei Gerong refinery is 475 miles.

Official ceremony opening the pipeline and terminal is planned for February. But for all practical purposes, Stanvac can check off as complete this part of its expansion in Indonesia. Stanvac's operating subsidiary, N.V. Standard-Vacuum Petroleum Mij., also recently opened a catalytic cracking unit at Sungei Gerong (OGJ, Dec. 16, p. 80).

Lirik was discovered in 1939. After a wartime lapse, Stanvac returned to the area in 1949. The company has spent several years designing and building the special facilities needed to handle the high pourpoint crude, which solidifies at 105° F.

Each well has hot water pipes running 500 ft. into the hole. A 3-in. hot-water line underlies the 20,000-bbl.-daily crude line. Buatan terminal has heater pumps, and the river tankers have tanks lined with heating coils.

The crude has two qualities offsetting this bother. It contains very little sulfur. It is especially good for catalytic cracking.

The field also gives Stanvac a new lease on life in Central Sumatra. Its other production in the area had dropped to 500 bbl. daily.

World briefs

The first oil test on a 48,000-acre concession in Guatemala will probably be spudded the end of this month. A. F. Lavender, president of Coastal Plains Oil Co., announced the shipment of more than 100 tons of drilling equipment from Houston for the Central American operation. Coastal Plains obtained the concession several months ago through merger with Sloane Exploration Co.

Gulf Oil Corp.'s concession over Cabinda on the west coast of Africa has become official. Officials of the company and the Portuguese Government recently signed an agreement in Lisbon. Cabinda Gulf Oil Co. will spend $6 million in 5 years for exploration in the small territory (OGJ, July 22, p. 70).

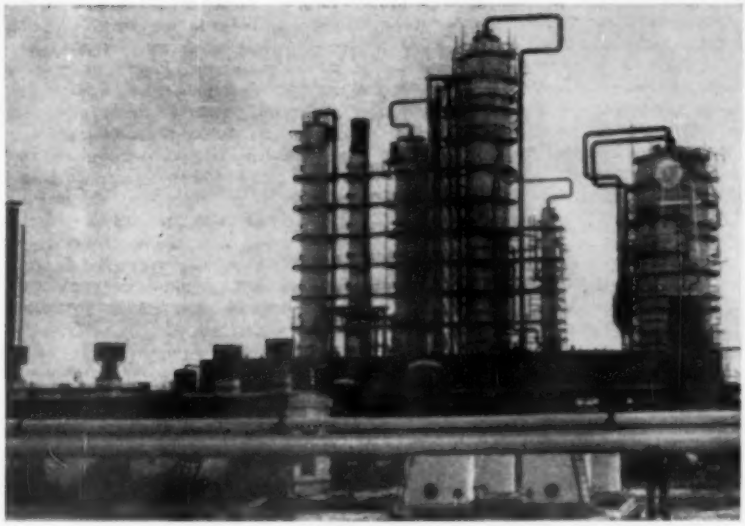
New Guinea has turned thumbs down on a concession claim made by German, American, and Swedish interests. The claim was made on the basis of rights granted by the German Government before World War I when the northeastern part of the island was controlled by Germany.

Esso-Rep, a subsidiary of the Standard Oil Co. (N. J.) affiliate in France, is holding talks with Cie. d'Exploitation Petroliere on a joint exploration project in Aquitaine basin. Esso agreed to joint operations with the French when it obtained two concessions covering 600 sq. miles last year.

Kuwait Oil Co., Ltd., plans a 70-mile, 30-in. crude line in 1959 from North Kuwait to the Ahmadi North tank farm. The project anticipates increased production for the tiny shaikhdom which has the world's largest reserves and is the Middle East's largest producer.

Kuwait Oil is completing 6 miles of 32-in. gravity line from South Ahmadi tank farm to the South Pier at Mina al Ahmadi terminal and 3 miles of 20-in. from the Burgan gathering system to the main line. Due for completion next year are 16½ miles of 38 and 40-in. from the North Ahmadi tank farm to the North Pier, 12½ miles of 32 and 34-in. from Burgan field to North Ahmadi.

Superior Oil Co. of Venezuela plans to lay 8,000 ft. of aluminum flow lines on an experimental basis in Lake Maracaibo. The 5-in. pipe will be supplied by Reynolds Metals Co. Creole Petroleum Corp. also recently announced plans for an underwater system of aluminum lines in the lake.



Russians Open Stalingrad Refinery

RUSSIAN REFINING is continuing its march northward from the old Baku producing area to the new "Second Baku" between the Volga River and the Ural Mountains.

With the opening of the new plant at Stalingrad, more than 50 per cent of the Soviet's refining capacity is processed in the new area, as compared with only 10 per cent in 1940.

In contrast, the Baku area along the Caspian Sea Coast now accounts for less than 33 per cent of the USSR's refining capacity. This compares with 84 per cent in 1940.

In its heyday, Baku provided more than half of Russia's crude-oil supply (OGJ, Oct. 28, p. 86). But since World War II the production scene has shifted to the new producing area. "Second Baku" now accounts for about 70 percent of the nation's crude output.

Russia reports that test runs at the new Stalingrad refinery began in November. Fed by a new 196-mile crude line from Zhirnoye field, the plant is designed to produce a big variety of products, including gasoline, kerosine, and diesel oil.

Italy May Get Shell Refinery

. . . at La Spezia by exercising option made 30 years ago. Oil from Egypt and Sicily may prompt government action.

ROYAL DUTCH-SHELL is due to find out this month whether it can keep its 35,000-bbl. refinery at La Spezia, Italy.

The Italian Government can take over the refinery next December if it wants to. Its decision will probably hinge on how well it is able to absorb new crude supplies under its present refining set up.

Italy has an option on the plant under terms of the original building permit. Shell agreed to give the plant to the government after 30 years in exchange for tax benefits. The plant is now 29 years old. Italy is supposed to give notice of its intentions 1 year in advance.

Italy could use the capacity to handle growing supplies of crude produced to the account of the government oil monopoly, Ente Nazionale Idrocarburi (ENI). The agency expects to import 20,000 bbl. daily from Egypt's Sinai Peninsula fields next year. It also plans to take 12,000 bbl. daily from its new Gela field in Sicily.

This crude could replace sterling and dollar crude purchased by financially pinched Italy from British and American companies. But ENI is believed committed to long term purchase contracts.

The two largest refineries in which ENI owns half interest or more are the 35,000-bbl. plant of Industria Raffinazione Oli Minerali at Venice, and the 49,000-bbl. Leghorn refinery of Stanic Industria Petrolifera. IROM is owned jointly with British Petroleum Co., Ltd., and Stanic with Standard Oil Co. (N.J.).

Italy, however, would not be able to obtain the La Spezia plant without cost. When Shell rebuilt and expanded the refinery after the war, the government agreed to pay for new facilities if and when it took over.

La Spezia would not be the first big refinery to revert to a government in the course of normal contract arrangements. The Colombian Government took over the 36,500-bbl. Barrancabermeja refinery from the old Tropical Oil Co. in 1951 when the De Mares concession expired. The Tropical Oil successor, International Petroleum Co. (Colombia), Ltd., now operates the plant on a contract basis.

Turk Test Started

by Tidewater on concession held by three-firm combine.

FIRST WILDCAT on a 3,000,000-acre concession held in southeastern Turkey has been spudded by an American oil syndicate.

The test is staked on a block 15 miles northeast of Nusaybin in the Mount Bakuk area. Tidewater Oil Co. is the operator. Partners are Atlantic Refining Co. and Seaboard Oil Co.

The wildcat is scheduled to test the Cretaceous section which is productive in Iraq to the south.

The Tidewater test was spudded after American Overseas Petroleum, Ltd., started its second Turkish wildcat. The Amoseas well is in the semiarid Gaziantep region. Its first test, 70 miles to the southwest, recently was abandoned at 10,153 ft.

Turkish American Oil Co. is the third company with a drilling program under way in Asian Turkey, other than the government itself. It is drilling under Iskenderun Gulf on a farmout from Gilliland Oil Co.

Subsidiaries of Standard Oil Co. (N.J.) and Royal Dutch-Shell have tests under way in Thrace, European Turkey.

Staples Visiting Pakistan

TIDEWATER OIL CO. may be the next American oil firm to take an active look at Pakistan. David Staples, Tidewater president, arrived in Karachi from London last week for a first-hand look at the country.

Staples says Tidewater has asked Pakistan for exploratory rights on about 10,000 sq. miles of territory between Karachi and Turbat in Baluchistan. The Tidewater president said his company's staff has already looked the area over and think "it may be worth exploring."

Drilling contractors are finding new applications for the

magnetic coupling and magnetic-particle brake

By E. A. Studer

SEVERAL RECENT applications of eddy-current electromagnetic devices extend the usefulness of these proven drilling devices. The magnetic-particle brake incorporates some more recently discovered principles of power transmission.

The dynamatic brake, an eddy-current electromagnetic dynamometer, has been adapted as an auxiliary draw-works brake for some 16 years. There are now about 400 applications of the eddy-current brake in use as auxiliary draw-works brakes in domestic and foreign oil fields.

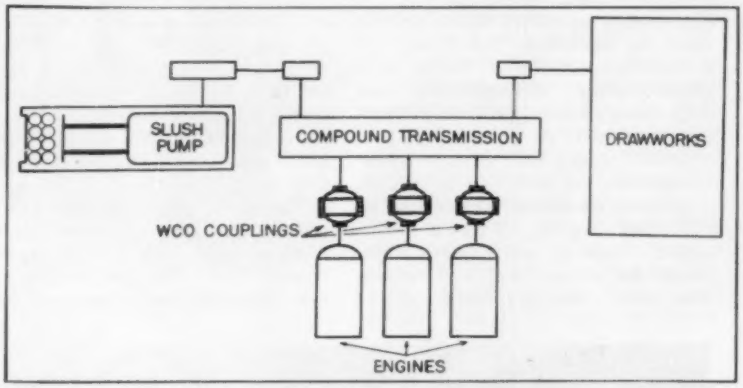
Eddy-current electromagnetic slip devices, applied to oil-well-drilling machinery, differ radically from so-called "electric brakes" which have been used for many years on traction, machine-tool, and other machinery. These are actually mechanical friction brakes that are electromagnetic only insofar as control is concerned.

Author is chief engineer, Baylor Co., Inc., Houston. Paper presented at annal AAODC meeting, Tulsa.

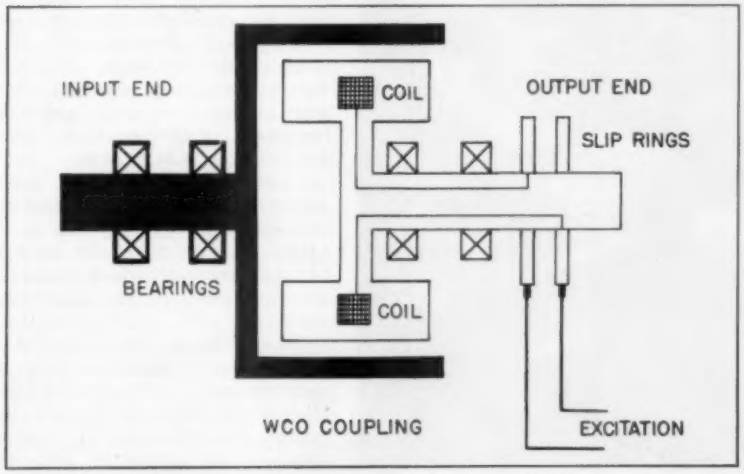
Electromagnetic Couplings

Electromagnetic coupling devices have no mechanical contact of the operating elements of slip devices as indicated in Fig. 1. Power is transmitted through these devices only by the linkage of a magnetic field. This is a sketch of a water-cooled, oil-field coupling.

The input shaft is direct-connected to the output shaft of a power supply; engine, electric motor, compound transmission, etc. A cylindrical drum, called the rotor, affixed to this input shaft rotates at all times when the power-supply output shaft is rotating. This rotor surrounds another, heavier, cylindrical assembly, called the magnet, which is affixed to the output shaft of the water-cooled coupling.



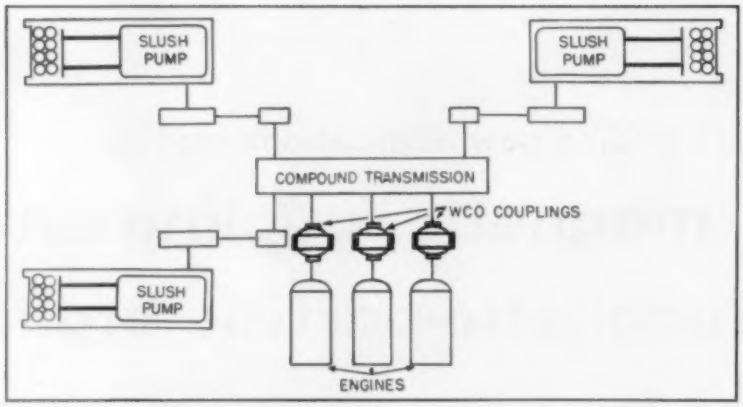
THREE WATER-COOLED COUPLINGS are installed between engines and transmission on rig of Norton Drilling Co. Fig. 2.



ELECTROMAGNETIC COUPLING DEVICES have no mechanical contact of the operating elements of slip devices. Fig. 1.

The magnet consists of iron pole pieces surrounding a coil which is excited by direct current which is externally variable from zero to predetermined maximum. With no excitation current in the coil, there is no magnetic field, no coupling between the input and output members, and no rotation of the output shaft. As the excitation is increased from zero to maximum, the magnetic field created by the magnet gives rise to a flux linkage which causes the magnet to rotate with the drum.

There is relative slip between the two members dependent on the



DRILLING TENDER of Gulf Oil Co. uses a compound transmission to power three slush pumps. Power is applied through three water-cooled couplings. Fig. 3.

amount of excitation and the load on the output shaft. As the excitation is increased, the slip decreases until at 100 per cent excitation the relative slip is less than 5 per cent with full load on the output shaft.

The torque-speed characteristics of a water-cooled coupling follow a definite family of curves which depend upon the excitation. This makes for a variable-speed-control device with torque-limiting characteristics and with shock-absorbing nature inherent in the magnetic air gap.

In 1951, the eddy-current water-cooled coupling was first applied as a power-transmission device on an oil-well-drilling rig. Three water-cooled couplings were installed between the engines and transmission. This installation, now being operated by Norton Drilling Co., is shown in block form as Fig. 2.

Other arrangements have evolved to fit specific designs and conditions. The offshore drilling tender, Gulf Oil M.V. "Eagle," utilizes a compound transmission to power three slush pumps. Three engines deliver a total of 2,240 hp., at 720 r.p.m. to the compound transmission through three water-cooled couplings, one coupling for each engine. This application is shown in Fig. 3. Similar applications are in use on the Gulf Oil M.V. "Pelican" and the CATC "Ernie Miller" (Fig. 4).

The next application incorporated water-cooled couplings to utilize existing equipment which a drilling contractor, Delta Marine Drilling Co., had idle and heavy a.c. equipment which the drilling contractor was able to procure at a bargain on the surplus market. In addition to the economy features, the drilling contractor gave consideration to the rugged nature and minimum maintenance requirements inherent in the squirrel-cage induction motor.

In this application, the two main pump drives each consist of a 700-hp. squirrel-cage motor which is direct-connected to a water-cooled coupling (Fig. 5). The output shaft of one coupling is chain-connected to a slush pump while the other coupling chain drives another slush pump.

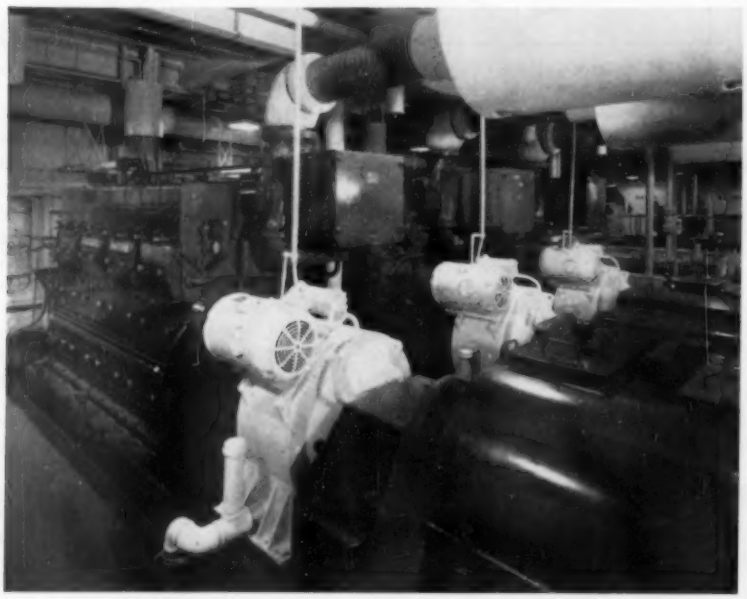
The pump drives are in a converted LST drilling tender, which also carries the diesel-electric generating equipment. The desired pump performance is attained by controlling the excitation of the water-cooled couplings from either the driller's position or the pump room, with the pump room having master control.

An independent standby pump is mounted on the drilling platform and is powered by a 300-hp. squirrel-cage motor, direct-connected to a water-cooled coupling. This pump is controlled by varying the excitation of the coupling from the driller's position only.

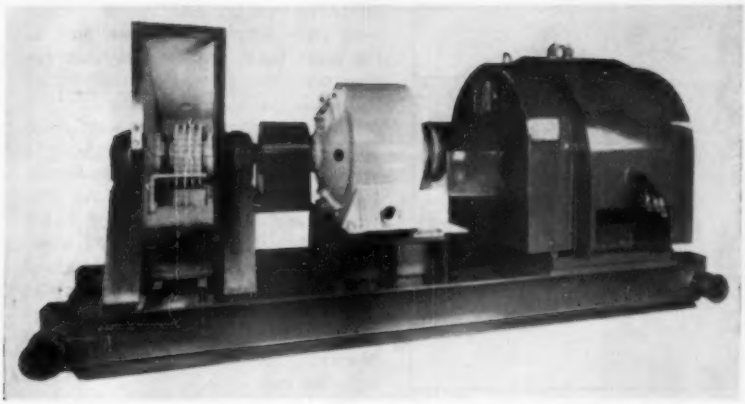
The draw-works drive package on this Delta Marine installation consists of two 700-hp. induction motors, identical to those used on the pump drives in the tender, each chain-connected to a coupling (Fig. 6). The output shaft of both of these couplings drive commonly into the input shaft of the selective transmission of the draw works. Control of the draw-works drive package is accomplished by varying the excitation of the couplings at the driller's position.

The next installation of water-cooled couplings to accommodate specific rig conditions was on Ocean Drilling & Exploration Co.'s deep-water submersible barge, "St. Louis." This application is shown in block form in Fig. 7 A similar application has been installed on Delta Marine Rig No. 2, "Chris Zeppa." in the St. Louis" installation, two engines deliver into the compound transmission approximately 3,200 hp. at 720 r.p.m. Two output shafts drive the two d.c. generators which provide the electric power for the draw-works motors.

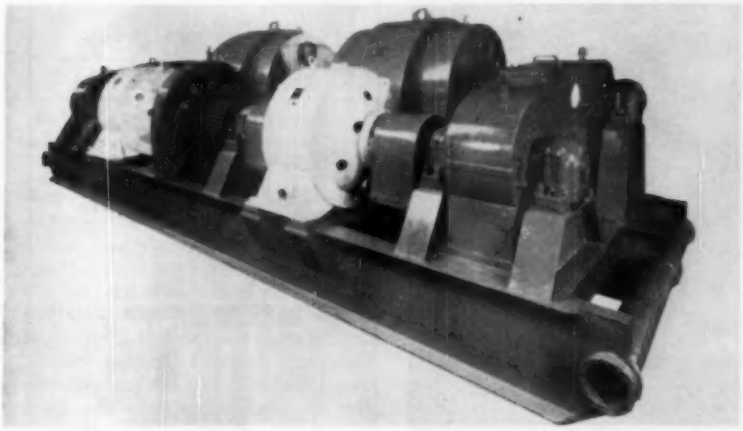
On each of the same output shafts, on the opposite side of the compound transmission, a water-cooled coupling chain-drives each of the two slush pumps. The engines run at a constant speed in this application, and draw-works control is accomplished by control of field excitation of the main



SIMILAR APPLICATIONS to that in Fig. 3 are in use on the Gulf Oil M. V. Pelican and the CATC Ernie Miller. Fig. 4.



TWO MAIN PUMP DRIVES each consist of a 700-hp. squirrel-cage motor direct-connected to a water-cooled coupling. Fig. 5.



TWO 700-HP. INDUCTION MOTORS are chain-connected to a coupling in this draw-works drive package. Fig. 6.

generators and the draw-works motors. The 720 r.p.m. of the engine shafts is increased to 1,200 r.p.m. at the output shaft (by sprocket ratio in the compound transmission).

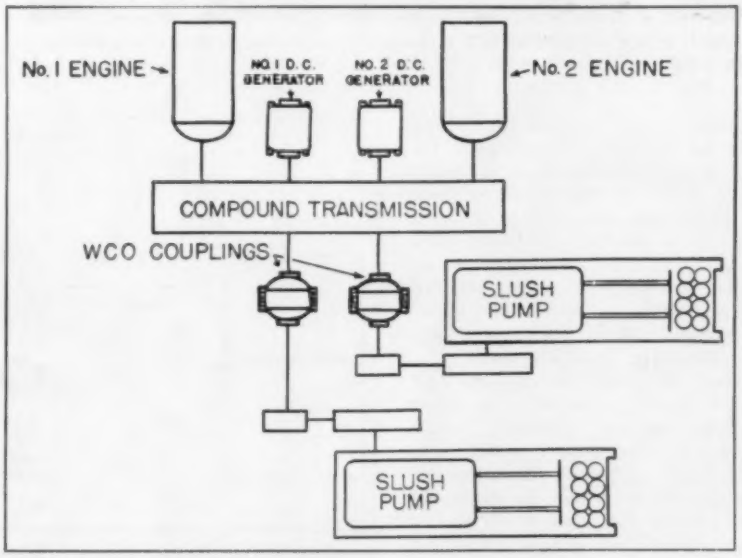
The desired pump perfomance is attained by controlling the excitation of the couplings at either the driller's position or in the pump room, with pump room having the master control.

An application of water-cooled couplings which is being used by Perforaciones Delta on its Drilling Tenders IV, V, and VI, on Lake Maracaibo in Venezuela, utilizes a unique arrangement of right-hand and left-hand engines in a combination electromechanical drive (Fig. 8). In this application, four engines drive a compound transmission in an extremely compact package, by virtue of the use of two right-hand engines on one side of the compound transmission and two left-hand engines on the other side. An output shaft in the aft end of the compound transmission drives two generators, one on each side of the compound transmission.

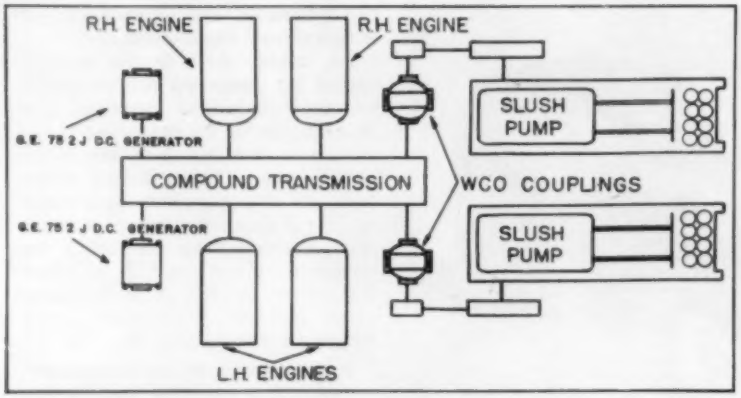
An output shaft in the forward end of the compound delivers power to two water-cooled couplings, one on each side of the compound transmission, each of which in turn drives a slush pump. During drilling operations, the engines operate at constant speed and the desired pump performance is attained by controlling the excitation of the couplings at either the driller's position or in the pump room, with the pump room having the master control (Fig. 9).

A modification of this arrangement is used by Kermac V on their Tenders I and II on Lake Maracaibo. In this installation three engines transmit power through air clutches into a compound transmission (all engines on the same side of the compound transmission). The extended engine output shafts of the forward and middle engines each deliver power to a coupling which in turn chain-drives a slush pump. The consideration of conducting air to the engine clutches was easily resolved by using through-tubes which pass through the drilled shafts of the couplings.

Another variation in the many possible installations concerns the possibility of applying a water-cooled coupling to a power rig which has multiple engines driving into a compound transmission which in turn drives a draw works and two or more slush pumps. A typical rig of this type is shown in Fig. 10. The coupling affords complete torque-speed control of the slush pump which it drives,



DEEP-WATER SUBMERSIBLE BARGE uses this application of water-cooled couplings. Fig. 7.



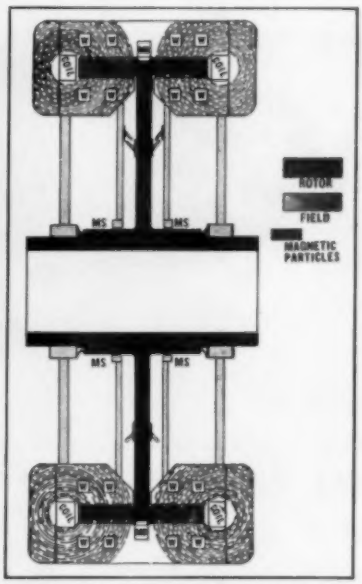
UNIQUE ARRANGEMENT of right-hand and left-hand engines in a combination electromechanical drive on a drilling tender on Lake Maracaibo. Fig. 8.

terms of torque and speed control with such direct connections, and, at the same time, procure optimum engine performance which would occur with constant-speed operation.

The pulsations which are reflected from the pump drive are causing a severe maintenance problem by abrading the fit between the heavy flywheels and their trunnion-mounted shafts. A water-cooled coupling is being installed between the compound transmission and each slush pump to obtain the desired speed-torque characteristics and to provide the shock-absorbing feature inherent in the magnetic air gap.

New couplings . . . The most recent

DESIRED PUMP PERFORMANCE is attained by controlling excitation of coupling at either driller's position or in pump room. Fig. 9.

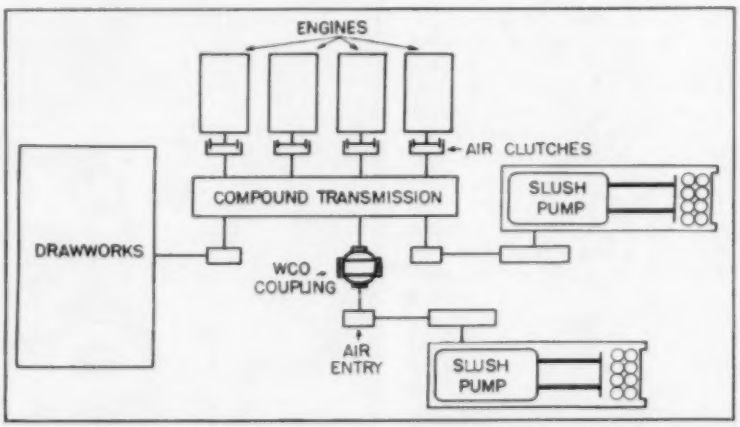


WATER-COOLED magnetic-particle brake. See text for meaning of letters. Fig. 11.

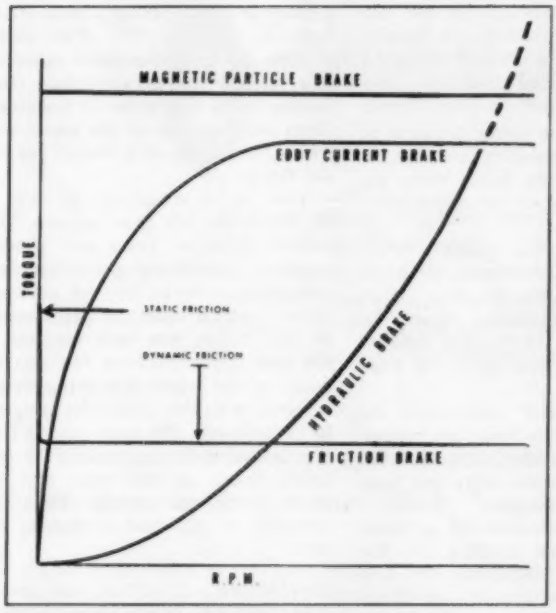
regardless of the fact that the engines may be operating at top speed for drilling requirements. Such an installation is now in the rigging-up stage at Levingston Shipyard at Orange, Tex., for C. B. Webster Drilling Co.

An application wherein the water-cooled couplings are being installed for a specific purpose is in connection with ODECO deep-water submersible barge "John Hayward."

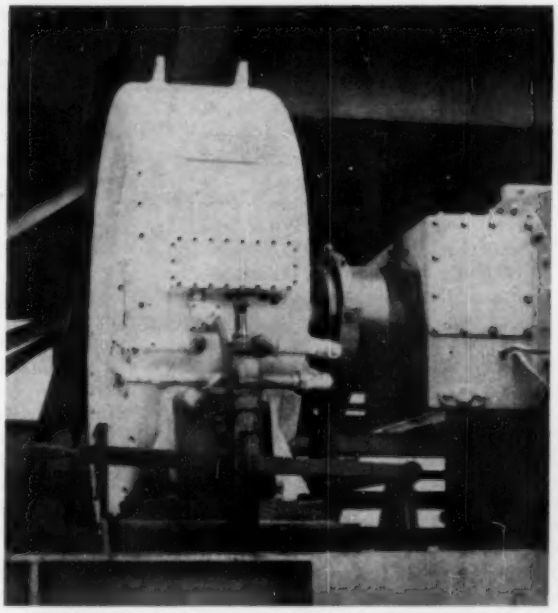
Here the prime movers are four diesel engines, equipped with heavy trunnion-mounted flywheels, which drive into a compound transmission. The output shafts of the compound transmission drive two d.c. generators and provide the input power to two direct-driven slush pumps. It has been found that it is difficult to attain desired slush-pump performance in



WATER-COOLED coupling applied to a power rig which has multiple engines driving into a compound transmission which in turn drives a draw works and two or more slush pumps. Fig. 10.



PERFORMANCE CHARACTERISTICS of the various types of brakes used on draw works. Fig. 12.



SHAFT EXTENSION for mechanically coupling the brake to the draw-works drum shaft. Fig. 13.

development in the field of power transmission with water-cooled couplings was placed in service in September. This application involves the use of a stationary-field eddy-current electromagnetic slip coupling which is designed to have all the electrical components in stationary members, obviating the use of any rotating electrical gear such as rotating coils, slip rings, etc., and providing a coupling which does not use brushes.

Such a coupling has now been installed between the input shaft of a small draw works and the draw-works prime mover, a 125-hp. 1,200-r.p.m. squirrel-cage induction motor. This motor-coupling combination replaces a wound-rotor motor which had incurred high maintenance costs. Larger sizes of stationary-field water-cooled eddy-current electromagnetic couplings are now being developed for oil-well drilling rigs.

Eddy-Current Brake

If the magnet section of the water-cooled coupling were to be affixed to a draw-works skid, and the rotor affixed to the drum shaft, the rotation of the drum shaft would be retarded to a speed which would be basically dependent on the drum-shaft torque and the excitation of the magnet coil. In essence, this is the development of an eddy-current draw-works brake.

The eddy-current draw-works brake makes an effective auxiliary draw-works brake. Deeper drilling and the resultant heavier drill string loads have demanded new thinking and design of many oil-well drilling-machinery items, including the auxiliary draw-works brake. Further, the increased demand for drill feed control on the larger rigs, along with a desire to reduce the number of mechanisms, such as chain drives, sensing devices, extra clutches, etc., stimulated thinking toward design of a single device which would accomplish both the functions of an auxiliary brake and an automatic drill feed control.

Certain developments resulting from research on eddy-current electromagnetic devices since World War II, coupled with improved techniques and results in powder metallurgy, led rather naturally to the design of the device known as the magnetic-particle brake, water-cooled, shown in Fig. 11.

In this cross-section of the brake, the principal components are designated by letters, as follows: (P) iron powder; (W) cooling-water channels; (F) magnetic field; (R) rotor; (MB) magnetic barrier; and (MS) magnetic seal. The rotor "R" is surrounded on each side by the field members "F" which contain the coils "C" which supply the magnetic field. The magnetic particles, or iron powder "P," partially fill the air gap, or space, between the rotor and the field members. The magnetic path passes through the iron powder and through the rotor causing the powder to align itself in the magnetic path and adhere to the field members and rotor.

The descending load of drill pipe or casing causes the rotor to turn through the magnetic particles, thus creating friction between the particles themselves and between the particles and adjacent surfaces of the rotor and field members. The resultant heat is carried away through water flowing through channels "W." The section "MB" between the two fields is a magnetic barrier to shunt the field to the desired path. The parts "MS" are magnetic seals to retain powder and to prevent its reaching bearing.

Performance . . . The performance characteristics of the various types of brakes used on draw works are shown in Fig. 12. Interest is principally centered on the left-hand portion of these curves, which concerns the operating drum-shaft speeds involved in retarding and stopping the descent of the drill string in tripping, and in providing the necessary torque to retard the descent of the drill string to conform with the desired predetermined constant weight of the bit.

Since the suspended weight of the drill string is directly proportional to the drum-shaft torque, the ideal condition to maintain constant weight on the bit would be satisfied by a device which would exert constant torque at a particular setting, regardless of drum-shaft speed. Such a device would be required to have infinitely adjustable settings to give the various values of torque required for varying loads or suspended weights of drill strings.

The horizontal line, "magnetic particle brake" on the speed-torque curves, indicates that the desired condition is satisfied by the magnetic-particle brake. In practice, this curve is moved up and down by varying the excitation current flowing in the field coils of the brake.

The driller accomplishes this by turning a dial handle at this position until the desired weight on the bit is shown by the weight indicator. The brake then automatically maintains this weight on the bit, independently of the rate of feed, by maintaining a constant torque on the drum shaft.

How it works . . . The exterior view of the completed brake (Fig. 13) shows the shaft extension for mechanically coupling the brake to the draw-works drum shaft. The piping visible is for the cooling water to the inner and outer cooling-water channels. The junction box above the piping on the rear of the brake serves to enclose the leads from the two coils inside the brake and to receive the two conductors which furnish the externally controlled excitation current for the magnetic-particle brake.

The view of the rotor, the view of the rotor-stator assembly and the exploded view of the brake show the relative simplicity of the major components (Fig. 14).

The first magnetic-particle brake was installed in February 1956 on Sun Oil Co. Rig No. 15 (Fig. 13). A view of this installation shows the manner in which the brake is installed and mechanically coupled to the draw works.

In this particular installation, the draw works and the brake are mounted in the substructure at truck level, and both are remotely controlled from the floor level above.

A recent application of a brake on Great Western Drilling Co. Rig No. 44 started operating in July 1957 on Phillips-Sinclair 1-A Montgomery in Pecos County, Texas (OGJ, Sept. 9, 1957, p. 93). This diesel-electric rig has stimulated considerable interest because of certain innovations in the adaptation of machinery items and because of the speed with which the rig was first moved for initial rigup.

This rig is scheduled to drill to 22,000 ft. on this first location. This wildcat in West Texas will provide excellent opportunity to test the magnetic-particle brake beyond any previous demands upon the performance of this brake, not only because of the total depth involved, but also because of the heavy drill-string weight involved with the drill-collar program to be followed, the many round trips required in drilling a well to the projected depth in this area, and the slow rates of penetration which can normally be expected in drilling this well.

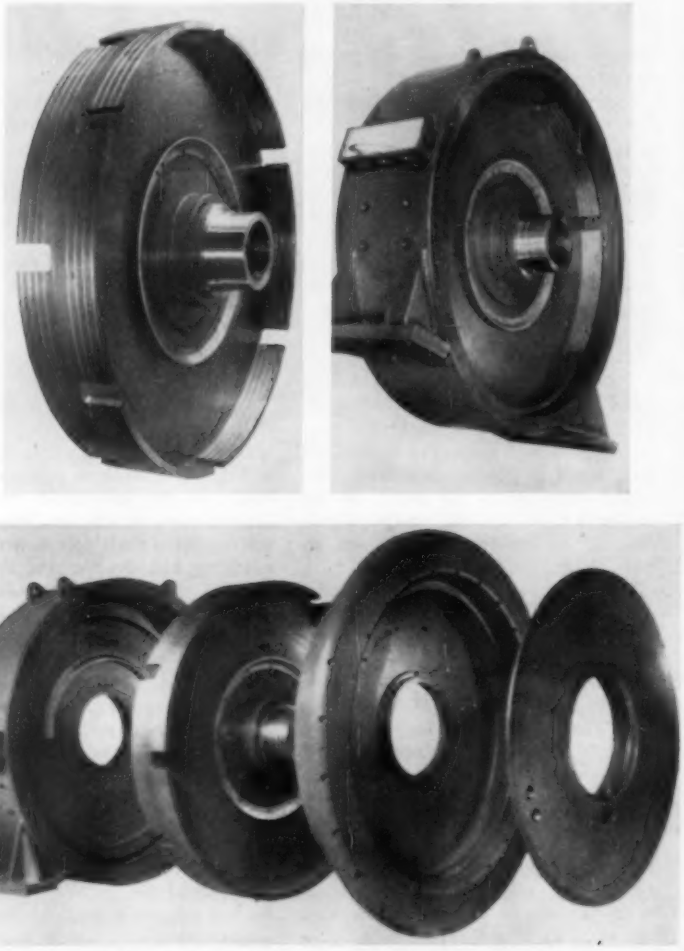
Powder life . . . There are several considerations which have already been brought to light in connection with the installations of the magnetic-particle brakes already in operation. One of the novel considerations on which there have been no previous data has been the life of the iron powder which comprises the magnetic particles. The first installation on the Sun rig operated over a period of 14 months with the initial charge of some 50 lb. of iron powder.

Tests are being conducted (necessarily in the brakes now in operation in the field) on various types of powder, both with regard to chemical composition, hardness, grain size ranges, and other mechanical properties.

Another prime consideration which has been brought to attention has been the necessity for adequate cooling water to carry off the great amounts of heat which are absorbed by the brake in performing its work in lowering heavy drill strings under control during tripping operations.

Although cooling-water requirements for many drilling rigs of today have generally increased several times over the requirements of the rigs of even a decade ago, the cooling-water systems have not always kept pace with the growth of the other machinery components.

In the magnetic-particle brake, it has become apparent that the life of the magnetic particles depend upon adequate cooling water being available, and it is believed that this factor will have a principal bearing on the life of the brake itself, as well as being established that optimum performance of the brake depends upon proper cooling.



ROTOR, ROTOR-STATOR ASSEMBLY and exploded view of the brake show the relative simplicity of the major components. Fig. 14.

2 CATALYST EROSION IN CAT CRACKERS

case histories of its control

Erosion occurs in many parts of the catalyst-carrying system of the fluid catalytic cracker. In this installment, Part 2 in a series, Larry Resen, Gulf Coast processing editor, has concentrated on the catalyst carrier line, the flue-gas stack and lines, and the aeration system. Part 1 of the series was published in the December 9 issue, P. 101; the next installment will appear in an early January issue.

Problem: Erosion of spent-catalyst carrier line
Solution: Install a modified "sugar scoop"

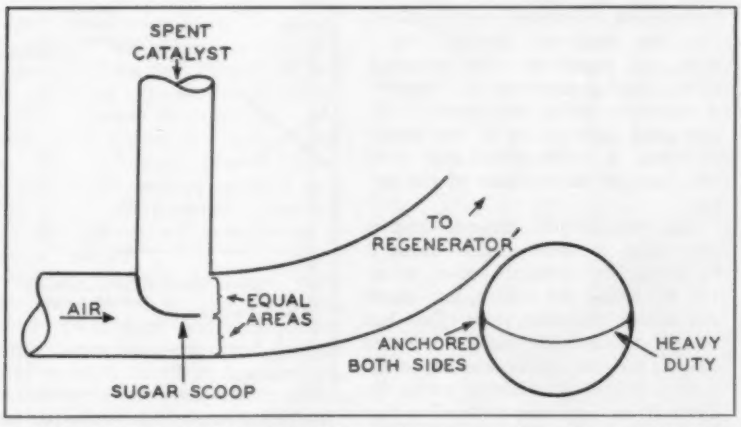
CONSIDERABLE EROSION occurred in the spent catalyst carrier line in the region where downcoming catalyst is picked up by incoming air and impinges against the walls of the carrier line.

Originally, a venturi type of restriction was used in this vicinity. However, the high resultant velocities and the wild catalyst flow accompanying them caused the spent-catalyst carrier line to be eaten through in a matter of 30-45 days.

A modified "sugar scoop" was installed immediately below the spent-catalyst standpipe. Catalyst hitting this was directed into the catalyst carrier line in a horizontal direction, where it was picked up and carried upward into the regenerator.

This sugar scoop was short and was only anchored (welded) along one side. The other side rode free in a guide to allow room for expansion. As a result of experience, this arrangement was changed somewhat. A new scoop was made of heavy-duty steel. It was lengthened so that the catalyst would have a better start forward. The scoop was then welded to the line, with the exception of the leading edge. In this manner, the line and scoop will expand as a unit. The best position of the scoop was determined to be in the exact center of the carrier line. The area below the scoop is about the same as the area above it, and this contributes to an even catalyst-air flow with a reduction in eddy currents.

This arrangement has reduced erosion and resulted in a considerable reduction in vibration.



SUGAR SCOOP should be installed with equal areas on either side to avoid eddies.

Problem: How to line catalyst carrier line
Solution: Use refractory in mix and cover with sodium silicate solution

ONE OF THE more popular means of protecting catalyst handling lines has been to gunite coat the carriers and equipment exposed to catalyst movement. One plant has found a special mix including a refractory material, crushed fire brick, and cement to be especially resistant to catalyst erosion. This is especially the case when the final dried coating is painted with a solution of sodium silicate.

In lining the equipment and carrier lines, the practice followed is to first weld hex metal to the surface to be lined. Welds are applied on 6-in. centers. This ⅜-in.-thick hex metal is installed so that the final layer will have a thickness of 1⅛ in. The material is then gunite-sprayed onto the hex metal screen. After spraying, trowels are used to remove any excess coating. Burlap is next used to wipe the surface so that bare metal of the hex steel is exposed. Any excess overlay of the coating will merely spall off during operations and tend to clog the system.

The gunite coating now being used includes the Corhart refractory, the firebrick, and the cement in ratios of 1:1:1. This ratio has proved the best combination to use. The refractory originally used in the mixture was obtained in random sizes ranging from ⅛ to ¼ in. in diameter This was unsatisfactory since catalyst erosive action would serve to dig out the large pebbles from the lining and result in some local accelerated erosion. Pulverized refractory was tried but found impractical to handle. The present refractory used consists of sizes ranging from ¼ to ⅛-in. diameter and has been quite satisfactory. This material consists primarily of an inter-

EROSION CONTROL IN CAT CRACKERS

locking structure of alumina and aluminum silicate. Its addition to the basic mix provides additional hardness to the liner.

The final step in lining the equipment is to apply three or four coats of the sodium silicate solution. This dries with a hard, glasslike surface and has proved successful in withstanding erosion. The slickness of the surface apparently reduces some of the erosive action of the catalyst. This solution is applied to not only the gunited lining's surface but also is used in the cyclones, in the plenum chamber around the stack exit, on control valves, and in the dip legs. In this latter case it is applied with a brush at the top of the dip leg and allowed to run down on the inside.

The silicate has proved effective in withstanding the abrasive action of the catalyst. A year's operation in some areas of the equipment has failed to break through the slick surface. In other, more erosive areas, the silicate and gunite mix have served to retard erosion.

Problem: Stack erosion

Solution: Double-ported slide valve, indicators

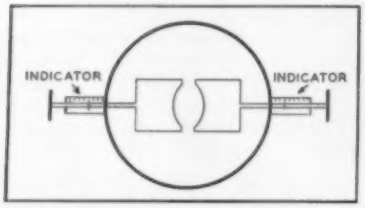
FLUE GASES off one fluid cat cracking unit are exhausted through two flue-gas stacks. One large stack is used to handle the bulk of the gas while the second, smaller stack is used for throttling action.

Originally, a single-disk slide valve was used to control the opening in the large flue-gas stack. With this in operation, flue gas was deflected and directed against the side of the stack. Result was a rapid rate of erosion just above the slide valve. The stack was eaten away within 7-8 months and frequent patching was necessary.

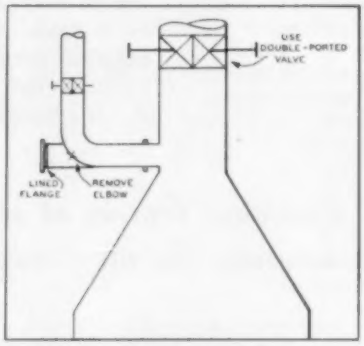
The simple solution here was to install a double-ported slide valve, as shown in Figs. 1 and 2. This installation serves to keep the flue-gas flow directly centered in the stack. The valve stems were equipped with a pointer scale to aid centering. A traveling pointer rides with each stem, and a divided scale is mounted alongside each stem. When manual adjustments are made, each slide can be accurately positioned by means of these calibrated indicators.

Elbow erosion . . . The small, controlling stack ties onto the main stack through an outlet port which is at right angles to the main flue-gas flow (Fig. 2). Originally, gas leaving through this 16-in. port passed through an elbow and up into the small control stack which, incidentally, is equipped with a double-ported hydraulically operated slide valve. A scouring action occurred within the elbow as the gas flow hit it. This caused a high rate of erosion.

A change was made which eliminated the elbow. A tee connection was made to the outlet flange of the main stack. The small stack was attached to the tee and a flange was used to seal off the end of the tee. This flange and the tee itself were lined with abrasive-resistant refractory material. Gas passing through the tee is diverted upwards through the small stack. The gas does strike against the flange, but this type of flow does not lend itself to a high rate of erosion as that through an elbow. The lining, meanwhile, helps to offset any erosive effects.



DOUBLE-PORTED slide valve will maintain flow in center of stack. Fig. 1.



STACK EROSION can be prevented with proper precautions. Fig. 2.

Problem: Erosion and noise in flue-gas stack

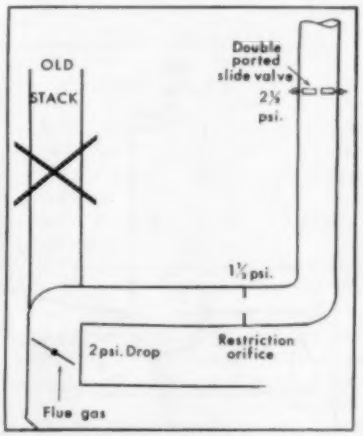
Solution: Double-ported slide valve and orifice

FLUE GAS being ejected from a unit caused a considerable amount of noise when the total pressure drop was taken over a butterfly valve in the stack. The high turbulence caused by the butterfly valve also resulted in a high rate of erosion of the stack.

A twofold approach was used to solve these problems. The original stack was terminated above the butterfly valve and a new stack installed. This new stack was installed with a slight jog, mainly to take advantage of the existing structure as a support. A restriction orifice was placed in the new stack downstream of the butterfly valve. A double-ported slide valve was installed downstream of the orifice.

The over-all 6-lb. pressure drop is now taken in three stages—about 2 lb. across the butterfly valve, about 1½ lb. across the orifice, and about 2½ across the slide valve. This has sharply reduced the noise since the drop to the atmosphere is much smaller than before. Turbulence across the butterfly has also been reduced so that erosion is not a significant factor.

The double-ported slide valve was installed to insure that the flue-gas flow would be maintained in the center of the new stack and not diverted to one side, which would cause a high rate of erosion. One side of the dou-



MODIFICATIONS reduce flue-gas stack noise and erosion.

ble-ported valve is manual, the other automatic. A continuous throttling action is maintained by the automatic side in response to unit conditions. As wear occurs, the manual side of the valve can be periodically adjusted to maintain flow in the exact center of the stack.

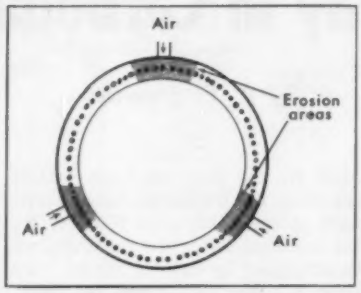
Problem: Erosion of aeration rings

Solution: Seal off critical areas

ONE TYPE of fluid unit regenerator has an aeration ring in its lower section. The ring is fed through several supply lines, and air is distributed into the regenerator proper through a series of evenly spaced holes around the aeration ring.

The air entering the ring through the inlet pipes would be at such a velocity that it created a low pressure area in the holes immediately adjacent to it. Catalyst would be sucked into these holes and then forced out through the next group of holes, adjacent to the low pressure holes. This resulted in an erosive condition to the extent that slots would be cut into the aeration ring, in these inlet areas thereby negating the ring's effect.

When the ring was examined, it was quite easy to determine which holes could be classified as "low-pressure catalyst inlets."



SEALING OFF sections of aeration rings reduces erosion.

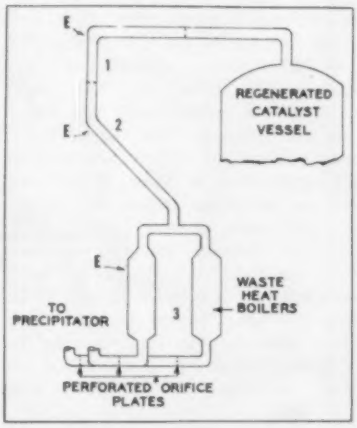
These holes were welded over on the new replacement ring. In this manner, incoming air velocity was somewhat equalized before it reached any aeration holes. Hence, low pressure areas were no longer in evidence, and no catalyst was sucked into the ring.

Problem: High erosion rate in flue-gas lines

Solution: Use perforated orifices

A HIGH RATE of erosion was being experienced in the flue-gas system of a unit downstream of the regenerated catalyst vessel. Severe erosion took place in (1) the mitered ell in the overhead line from the vessel; (2) in the 45° bend where the flue-gas downcoming line makes a jog, and (3) in the waste-heat boilers. Early modifications were made to enlarge the flue-gas line and to install orifices upstream of the 90° mitered ell and the 45° bend. These changes did not greatly improve the situation; focal point of the erosion was merely shifted. The turbulence created downstream of the orifices resulted in a high rate of deterioration in the carrier line immediately downstream of the two orifices.

Another modification was made just downstream of the waste-heat boiler where three perforated orifice plates were installed. The pressure drop is taken in three 3-psi. stages, and there is no great effect across any one of the orifices. Using perforated, rather than single orifice plates, the over-all turbulent effect is considerably reduced and only small, inconsequential eddies are set up across the many individual openings across the plates. The single-plate orifices in the catalyst line upstream of the waste-heat boilers were removed as part of this modification.



PERFORATED orifice plates reduce erosion rates in flue-gas system.

The immediate effect of this modification could be seen in the waste-heat boiler where catalyst velocity dropped from 200 ft. per second down to 120 ft. Catalyst rate is about 90 tons per day in this flue-gas system. The perforated orifices would probably have worked satisfactorily upstream of the waste-heat boilers, but they were installed downstream so that the boilers would benefit from their effect in keeping the system under pressure as long as possible.

This modification has helped to practically eliminate erosion in the line and has retarded it to a great degree in the boilers.

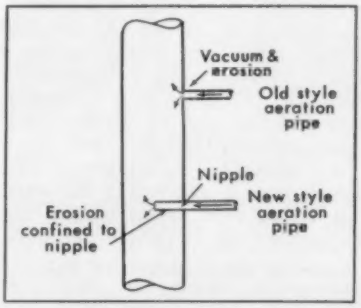
Problem: Aeration-pipe erosion

Solution: Use nipples

IN VARIOUS STANDPIPES, air is injected to maintain the desired catalyst density within the pipe. A series of aeration tubes are welded to the standpipe and air is passed from these tubes into the standpipe as desired.

In installations where these tubes end up flush with the interior of the standpipes, eddies are set up around the junctures. This results in turbulence and a resultant high rate of erosion. Since erosion takes place on the standpipe itself, this condition can quickly become critical.

Nipples were welded to the aeration tubes to extend them within the standpipe for a distance of several inches. Air can be injected as before with the same effect. Erosion, meanwhile, will still take place around the tubes, but the attack will be confined to the extended tubes. The nipples can be replaced at a low cost. Of much greater importance, the standpipe will not be subject to the high rate of erosion previously experienced.



MODIFIED aeration piping.

Here is reported how three logging methods have been combined and are proving successful in the job of

Figuring Net Pay in Carbonate Reservoirs

By R. E. Stewart

INTERPRETATION of logs of heterogeneous limestones is quite difficult because of the high contrast between formation resistivity and the mud resistivity. Another condition that complicates the issue is thin porosity variation inch by inch between dense high resistive beds. These nonhomogeneous reservoirs can have many types of porosity development ranging from very fine intergranular and intercrystalline porosity to highly fractured or vugular porosity and combinations of all four. Each type of matrix exercises a different effect on the various types of electrical logging devices used.

The combination of logging methods that has proven to be quite successful for the determination of net pay in the carbonate reservoirs is the gamma ray-neutron, guard, and guard-contact logs.

Basic tools . . . The three basic reservoir equations used in log interpretation in other areas are still considered fundamental and basic for carbonate reservoirs. These are:

$$F = R_o/R_w;\ F = 1/\phi^m;$$

$$S = (R_o/R_t)^{1/n}$$

The gamma-neutron will be used to obtain the porosity and in general it is the best porosity tool available for porosities in carbonate rocks. From the porosity we can now calculate the formation factor by solving the equation $F = 1/\phi^m$ using a cementation factor, m, of 2.3 for most limestones and dolomites and 2.0 for cemented sands and some Devonian dolomite.

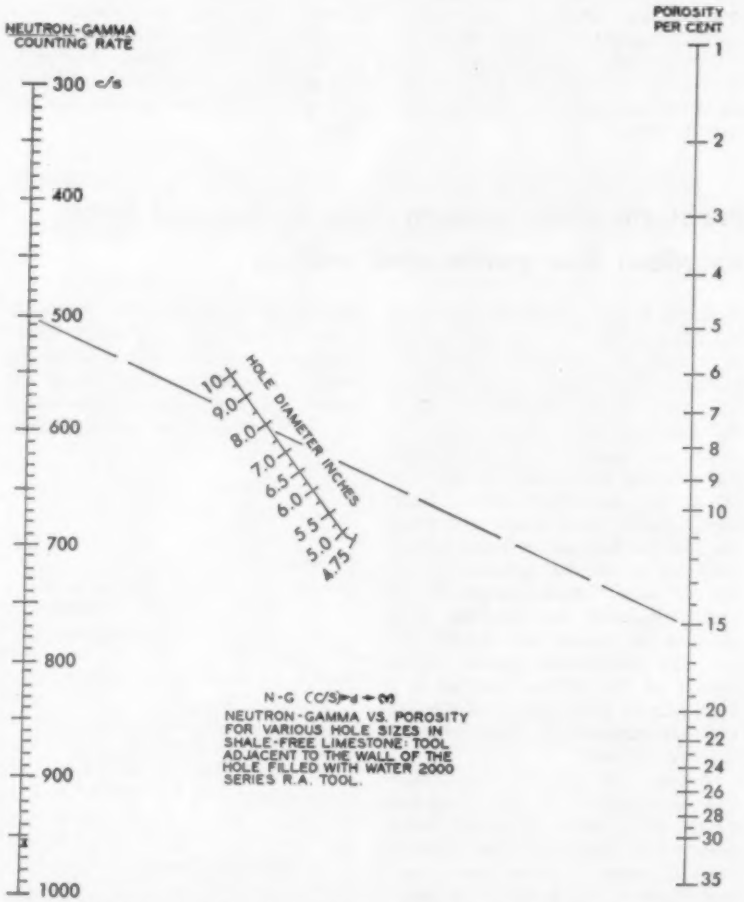
By obtaining a formation-water sample from a near well, a drill-stem test, or any other source such as the formation-water resistivities as published by the Permian basin AIME and using the formation factor previously obtained, we solve $F = R_o/R_w$ and calculate R_o or the resistivity we would expect to have if all the pore space is filled with formation water.

We now need to calculate the saturation or the percentage of pore space occupied by water. To calculate saturation using the equation

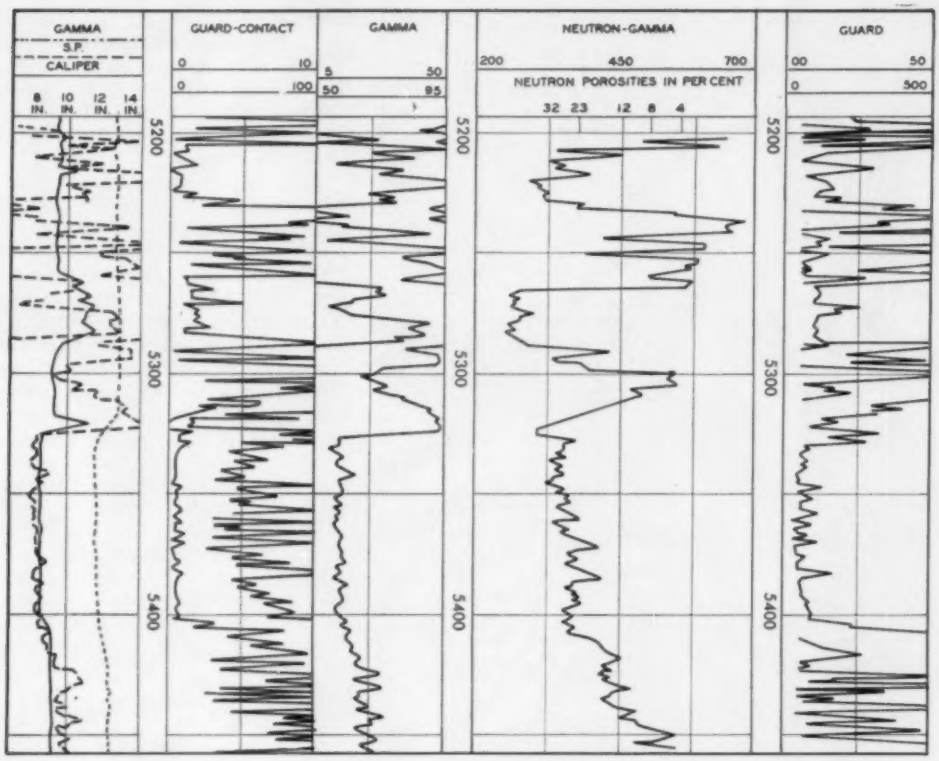
$$S = (R_o/R_t)^{1/2}$$

we will need true resistivity which is obtained from the guard log. This saturation subtracted from 1 gives the

Author is with Halliburton Oil Well Cementing Co., Midland, Tex. Paper presented at McMurray College logging conference.



RATE, HOLE SIZE, AND POROSITY are related as shown in this nomograph. Example is for 7⅞-in. and 500 counts per second. Porosity is 15 per cent. Fig. 1.



THREE logging methods were used on this well in Upton County, Texas. Detailed data are obtained on the well using the three-log combination. Fig. 2.

fractional amount of space occupied by a nonconducting material which is assumed to be oil or gas.

Porosity . . . To obtain porosity from the radioactivity log it is necessary to have a log that is standardized and calibrated so that a given porosity or amount of hydrogen will give the same response on every logging instrument regardless of operator or truck. To do this the instruments should be standardized at the time they are manufactured, and when an instrument is completed, the source, calibrating standard, and downhole instrument are one unit not interchangeable with other sources or instruments.

Each unit is placed in a standard calibrating tank and the sensitivity adjusted to conform with the counting rate of all other instruments. With this sensitivity the calibrating standard is placed on the instrument and the observed counting rate stamped on it. This standard, which has a half life of 1,500 years, is used to calibrate the instrument.

This calibration should be and is done before and after the survey to make certain that there have been no changes in sensitivity of equipment due to the bore-hole conditions or other causes. This insures a log of standard quality and quantity of counting rate.

With this control it is possible to establish a scale for porosity assuming the hole size is known. The derived nomograph for counting rate, hole size, and porosity is shown in Fig. 1. An example for 7⅞-in. hole and 500 counts per second is shown. Corrosponding porosity is 15 per cent.[1]

Flushed-zone resistivity . . . The guard-contact gives a focused resistivity reading taken from a pad built to conform to the side of the hole and measures the resistivity of the formation near the bore hole in which we hope to have an invaded zone. The contact caliper that is recorded with this survey proves very useful in determining hole size to improve the neutron porosity interpretation.

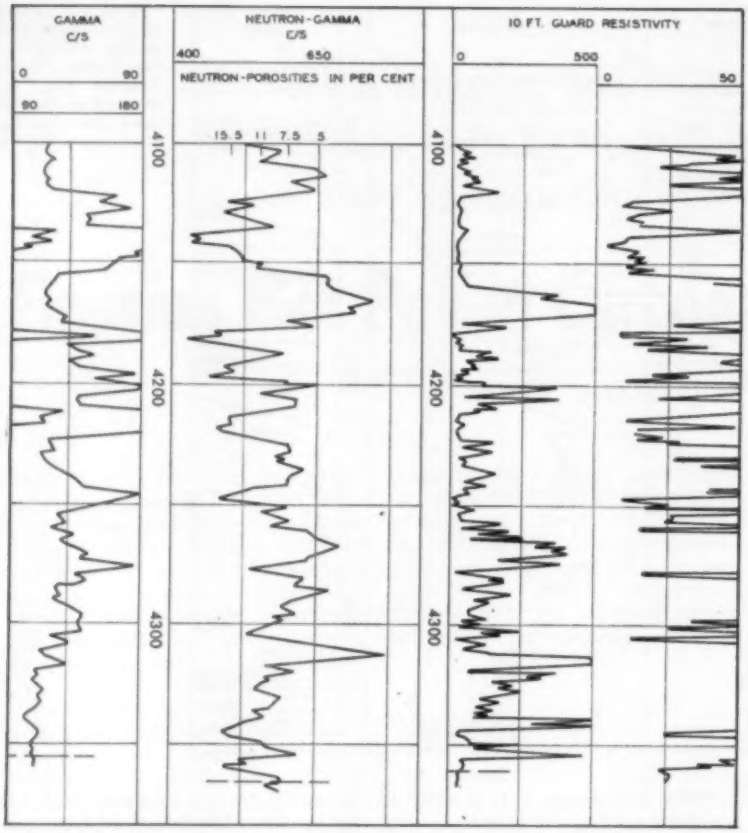
We can also locate the invaded zones and those having a mud cake. These zones will certainly be permeable and worthy of detailed analysis. The R_{xo} zone, or resistivity of the flushed zone as measured on the guard-contact, can in some cases be used to calculate porosity by solving $F = R_{xo}/R_{mf} = 1/\phi^m$ but quite often the flushing is not at all complete and the results from this type of porosity tool in carbonate rocks do not check core analysis nearly as well as the neutron porosities.

True resistivity . . . The guard instrument is a focusing device designed primarily for low-resistivity mud and gives excellent readings of true resistivity for beds as thin as 2½ times hole diameter. Minimum corrections are applied and reliable results obtained as long as the resistivity of the mud is not more than five times the formation water resistivity.

Devonian example . . . Fig. 2 shows the gamma-ray neutron, guard, and guard-contact logs on a well in Upton County, Texas. The section of interest shown here from 5,324 to 5,402 ft. is the Devonian and is a weathered chert section. Applying the neutron porosity scale we obtain the porosity of 27 per cent as shown on the gamma-ray neutrol log.

This value is exceptionally high for West Texas but the average porosity in the same section in the nearest field is 21 per cent which means we are certainly in the ball park.

No cores were available on this well but let us now see what porosity the guard-contact would calculate. Using the equation $F = R_{xo}/R_{mf}$ we have R_{xo} from guard-contact = 4.5 ohm m. R_{mf} as measured = 0.28 ohm m. This gives $F = 4.5/0.28 = 16$. Solving equation $F = 1/\phi^m$ assuming $m = 2$, we have $\phi = 25$ per cent, within 2 per cent of the neutron porosity. We should expect fairly good results from the guard-contact because of the high porosity which would flush



SAN ANDRES WELL, Harper field, Ector County, Texas, was logged using the three logging methods. Fig. 3.

well and has an ample mud cake as shown on the caliper.

A formation water sample was obtained and measured $R_w = 0.10$ at formation temperature. Let us now calculate saturation. Using the neutron porosity of 27 per cent, $F = 1/0.27^2 = 14 = R_o/R_w$. $R_o = 0.10 \times 14 = 1.4$ ohm m. Resistivity from the guard log in the zone 5,336 to 5,340 ft. is equal to 7 ohm m. and corrected through departure curves for hole size and invaded zones gives $R_t = 7.7$ ohm m. Saturation is equal to the square root of $1.4/7.7 = 42$ per cent.

This saturation was consistent with slight variations in porosity down to 5,355 ft. The zone from 5,360 to 5,362 ft. gave a porosity of 30 per cent and going through the same method for calculating saturation, the value of 55 per cent water was obtained. This percentage increased slightly with increasing depth which leads us to think that there is possible oil production above 5,355 ft. but the 55 per cent water would surely begin to produce large amounts of water.

A drill-stem test from 5,310 to 5,355 ft. gave gas to surface in 8 minutes, with a recovery of 90 ft. of gas-cut mud, 350 ft. of oil, and 100 ft. of gas and oil-cut salt water. Another drill-stem test from 5,355 to 5,380 ft. gave gas to surface in 45 minutes, with a recovery of 150 ft. of heavily gas and oil-cut water and 800 ft. of slightly oil and gas-cut water. The well was perforated from 5,324 to 5,334 ft. with four shots per foot and acidized with 3,000 gal. It potentialed for 80 bbl. of oil per day and 15 bbl. of salt water per day.

San Andres example . . . Fig. 3 shows the logs on a San Andres well in Harper field in Ector County, Texas. The porosity scale has been placed on the log from the nomograph. There seems to be four zones of interest when we examine the gamma-ray neutron log. One is from 4,220 to 4,245 ft., one from 4,250 to 4,260 ft., one from 4,290 to 4,300 ft., and another from 4,316 to 4,350 ft.

Using the same three equations we solve first using $F = 1/\phi^{2.3}$ for the formation factor. $\phi = 0.085$, $F = 1/0.085^{2.3} = 278$. Now using $F = R_o/R_w$ and having a formation-water resistivity of 0.053 at bottom-hole temperature, $R_o = 278 \times 0.053 = 14.7$. Resistivity from the guard log is read to be 50 ohm m. and taking this value through the guard departure curve we obtain $R_t = 80$, $S = (R_o/R_t)^{1/2} = (14.7/80)^{1/2} = 0.43$ or 43 per cent.

By using the same procedure and calculating saturation for all the other zones we obtain a saturation of 49 per cent, 4,254 ft.; 45 per cent, 4,292 ft.; 20 per cent, 4,326 ft., and 30 per cent, 4,344 ft. Notice that even though the resistivities were quite low in the lower zone the saturations were low because of the high porosities. On the basis of these calculations the lower zone was perforated and potentialed for 140 bbl. of oil per day with no water.

These calculations are straightforward and relatively simple and based on proven principles. Charts to expedite these calculations are available.[2] However, the results of saturation and porosity are not always conclusive because we are not always positive what porosity and saturation are necessary to make a commercial well.

Water-Free Production

For years we have used rules of thumb and guessed at what might be water-free production. For clean sand reservoirs such figures as 35 to 40 per cent water are considered to be the upper limit of water-free oil production but as sands become shaly or silty they can hold more water up to 50 to 60 per cent and still produce 100 per cent oil. This is because the fine clay particles have a high surface area and can absorb more water and hold it while the oil passes out of the formation.

This actually is a function of capillarity. For a clean sand on the Gulf Coast the value of critical saturation would remain constant because the porosities are fairly uniform and the sand grains fairly constant in size. Trial and error would soon tell what saturation was critical.

For carbonate rocks we can have various types of porosity development ranging from 0.5 per cent up to 30 per cent and consisting of vugs, fractures, intergranular porosities, intercrystalline porosities, and combinations of all four. For these conditions it will be impossible to try to arrive at a porosity and saturation that will be critical for all rock types. We would expect an earthy intergranular porosity to be capable of holding more water without producing it than a vugular porosity.

Capillary pressure curves . . . To give an insight into the rock properties that control the amount of water a

given rock can hold we must resort to capillary pressure studies. Studies of capillary properties indicate that for a given rock type the porosity and permeability are directly related.

Just what is a capillary-pressure curve? Perhaps this can best be understood by explaining how one is obtained. First a core is completely dried and cleaned of all its original fluids. If the mercury-air method is to be used the core is now ready for the test, but if the water and oil system is used it must be thoroughly saturated with water. It matters little what system we use, the results are comparable and the object is to try to reproduce the phenomenon that takes place in the reservoir when a water-wet formation is invaded by oil.

In the mercury-air system the air represents the wetting phase or water phase and the mercury represents the nonwetting or oil phase. The capillarity of the formation determines how much water a water-wet rock will hold when invaded by oil. A core of 20 per cent porosity and 100 per cent air filled is placed in a cylinder containing mercury and it is then subjected to pressure. The amount of mercury absorbed by the core is measured at various pressures and the plot as shown on Fig. 4 is obtained.

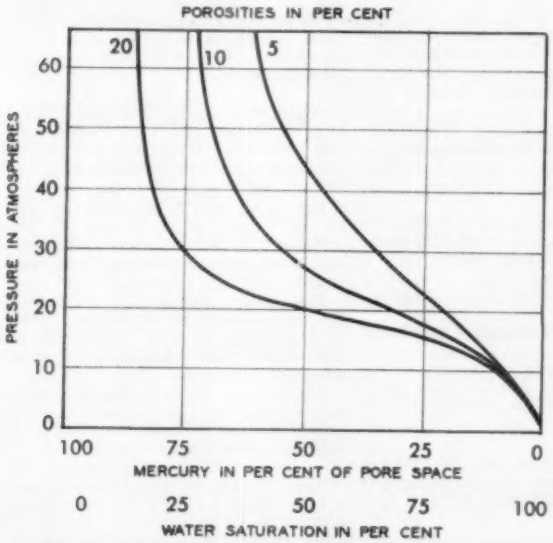
It makes little difference which system is used; the curve shape is similar. For zero pressure none of the pore space is occupied by mercury. As the pressure is increased some of the air is displaced by mercury until at some point we begin to force in larger amounts of mercury with little increase in pressure until most of the movable air is displaced and only the air firmly held by the rock surface remains with higher and higher pressures little or no air is removed. This amount remaining would be the irreducible water saturation.

If the abscissa scale is mercury or oil, a reverse plot would be air or water saturation, the per cent of pore space filled with water. By choosing another core and another porosity of 10 per cent but the same rock type the same procedure is followed and another curve results. Another core of 5 per cent porosity and the same rock type would result in another curve (see Fig. 4).

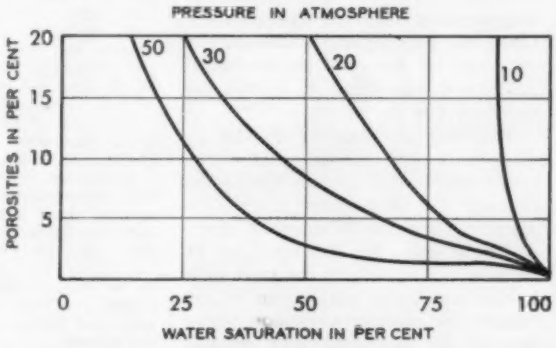
In Fig. 4 we have pressure versus saturation for a given rock type at various porosities. This plot can be reproduced and presented in the form of Fig. 5 where the porosities are plotted against saturation for varying pressures. Our logging techniques cannot give us pressure but we have seen that we can calculate saturation and porosity.

Represents water level . . . From this information we can assume that the higher pressures would represent the conditions existing at a great distance above the water level. We can now plot our porosities and saturations as obtained from the logs and if they coincide with the higher pressure curve we can be confident that this zone should be well above a free-water level and would produce oil. As the points go to lower pressures with increase in depth it is indicative of an approaching water level and increased water production. By applying such data to producing wells it should be possible to determine what pressure correlation should begin to produce water for a given rock type.

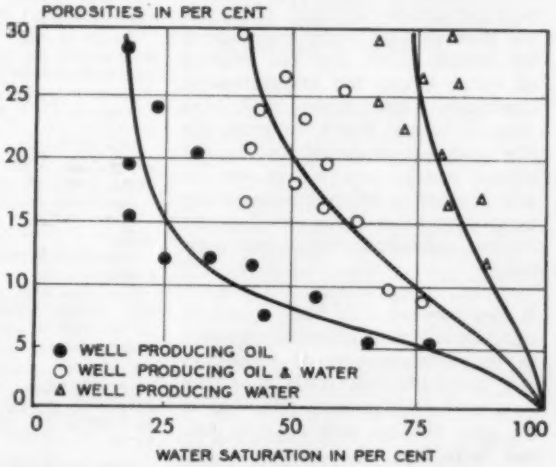
Cutoff porosity . . . Another application for such a plot is the determination of a "cutoff' porosity or a porosity below which little or no oil production could be expected. Rockwood, Langford, and Lair published a paper which presents this information in detail.[3] They suggest the intersection of the 50 per cent saturation and the 62-atm. curve to be used for locating cutoff porosity.



PRESSURE VERSUS SATURATION for a given rock type at various porosities. Fig. 4.



POROSITIES VERSUS SATURATION for varying pressures can be plotted from the data in Fig. 4. Fig. 5.



WATER-SATURATION plots can be used to determine cutoff porosity and critical pressure correlations. Fig. 6.

Others suggest the intersection of two lines. One would be tangent to the vertical part of the curve and another would be through the flat portion of the curve. Their intersection would be used as the point for locating cutoff porosity.

The sudden decrease in oil for slight changes in porosity must surely indicate that porosities lower than the inflection would allow little oil to enter the rock so certainly little can be produced from porosities below this point. Therefore, the inflection point on the pressure curve could be used to determine cutoff porosity. All three methods will give close to the same result.

Amount of oil . . . After cutoff porosity is determined, we can now take the gamma-ray neutron log and locate all zones with porosities greater than cutoff porosity. These are the zones to perforate and also are the zones to consider in calculating reserves.

By averaging the porosity above cutoff and obtaining an average porosity we can now return to the statistically determined curve and obtain the average saturation for this porosity. Using this porosity and saturation and the feet of net pay above cutoff porosity a calculation of barrels per acre-foot can be made.

You may say that we do not always have restored-state core analyses available and actually we usually do not. To solve these cases it is necessary to form the curve from actual well data. By logging 8 or 10 wells in the field from the high wells to the low wells, curves can be developed by plotting saturation versus porosity as calculated. The productivity of the well is noted.

The plot on a well making 100 per cent oil can be assumed to be at a high pressure on our chart. One making part oil and water approaching the critical point and one making all water locates the lower pressure conditions. These might result in a graph as seen in Fig. 6. By using this plot to determine cutoff porosity and critical pressure correlations, we can now proceed as before by considering the porous zones above cutoff porosity and calculating barrels per acre-foot.

A step forward . . . This procedure certainly is a more scientific approach to the determination of productive and nonproductive zones than has been used for carbonate reservoirs in the past. We can now begin to predict from logs what saturation and porosity will be necessary for a given rock type to produce commercially.

It must be remembered, however, that we must have an understanding of the rock type present. These rock types change and this change will often explain peculiar behavior of wells that "should have been producers." This is not a simple method and the problem is not a simple one so we cannot expect the solution to be easy.

Success has been achieved with the method. Unfortunately we do not have enough data at our disposal to determine a definite success ratio but we feel that it is a sound approach to the determination of net pay in carbonate rocks.

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2. The Application of Radiation Guard Surveys to the West Texas, New Mexico Province. EWSRL No. 127, Halliburton Oil Well Cementing Co., Research Laboratory, Houston.
3. Rockwood, S. H., Lair, G. H., Langford, B. J., "Reservoir Volumetric Parameters Defined by Capillary Pressure Studies." Presented at the 1956 fall meeting of AIME.

BOOKS

FIFTH ANNUAL INSTITUTE ON MINERAL LAW edited by Harriet S. Daggett. Published by Louisiana State University Press, Baton Rouge 3, La. 181 pp. $7.50. Publication date, October 1, 1957.

This new book presents papers presented at the Fifth Annual Institute on Mineral Law. Both practitioners of oil and gas law and attorneys who are working with mineral law on active fronts have found these annual sessions worthwhile. Papers presented are:

Income Tax Consequences of Lease and Sale of Mineral Interests by A. E. Hughes. This paper includes: (1) guaranteed minimum royalty, (2) position of attorneys, lease brokers, etc., who receive portions of mineral interests as fee, (3) operation of leases, (4) dividing and disposition of an interest, (5) unitization, and other related subjects.

Financing of Oil and Gas Interests by A. E. Alexander. This includes variations of the A.B.C. plan.

Application of Curative Statutes in Land Title Examinations by James L. Helm. A selected list of Louisiana statutes of repose and prescription and other laws relating to land titles are given. Other papers are: Louisiana's Title in the Gulf of Mexico by W. Scott Wilkinson; Well Spacing by Rupert C. Craze and James W. Glanville; and court rulings and decisions, both state and federal.

INDUSTRIAL WATER AND INDUSTRIAL WASTE WATER. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia, 52 pages, $2.

This is an A.S.T.M. special technical publication covering the symposium at the Second Pacific Area National Meeting at Los Angeles under the auspices of the A.S.T.M. Committee D-19 on Industrial Water. The papers include:

Use of Organic Flocculants and Flocculating Aids in the Treatment of Industrial Water and Industrial Waste Water.

Sea Water Purification.

Water Pollution Control in Los Angeles Area.

Industrial Waste Problems in Southern California.

The book is of interest to chemists, water and sanitary engineers, and all those concerned with the source, use, and disposal of industrial water.

MATERIALS HANDLING EQUIPMENT by D. Oliphant Haynes. Published by Chilton Co., Philadelphia, Pa. 636 pp. $17.50.

Here is a book which gives good graphical presentation of materials-handling equipment. Line drawings are used to illustrate the basic internal parts of these machines.

The book deals entirely with the movement of materials which are semisolid and solid. The author explains both the new, up-to-the-minute systems and those that are basic, tried, and proved. These include: transporting equipment, elevating equipment, conveying equipment, transferring equipment, self-loading equipment, bulk-handling equipment, and accessory equipment.

The information is presented in such a way that a new basis of materials-handling equipment can be readily coordinated with equipment planned or already in use.

This book is timely in that it takes up a field which is still presenting cost-cutting opportunities and thereby paves the way for an improved competitive position.

HANDBOOK OF CHEMICAL DATA edited by F. W. Atack. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22, N. Y. 627 pp. $6.75.

This pocket-size handbook contains a vast array of facts all chemists need in their work. It is exactly what the title states and presents relevant tables of physical constants and properties. It covers the whole range of data indispensable to the active chemist in every field.

The book's small format is specially designed to render a handy, lightweight volume that is easily taken anywhere. The accurate and readily accessible tables of constants are extremely helpful and time-saving even to those who have access to a complete library.

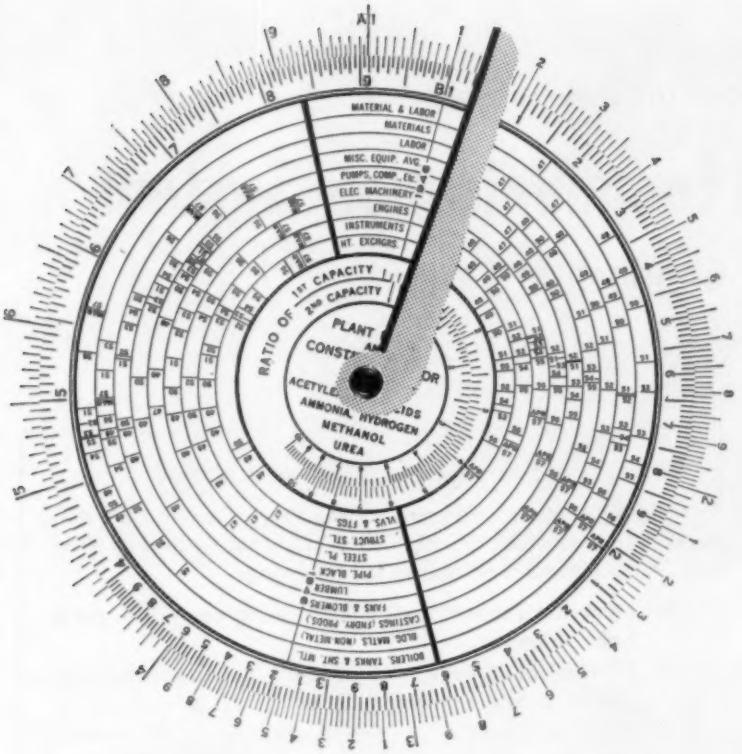
PRINCIPLES OF STRATIGRAPHY by Carl O. Dunbar and John Rodgers. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, New York, 356 pp., $10.

This is the first broad survey of stratigraphic principles in over 40 years. Although the book stresses principles, it uses many examples familiar to oil geologists.

The authors start with a discussion of the environments of deposition, followed by a treatment of basic stratigraphic relations. After this, they describe specific lithotopes.

The book is very well illustrated and includes many maps and cross-sections. The photographs in particular are useful supplements to the written material.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.



Cost projector slide rule

speeds preparation of an estimate . . .

uses Journal Construction Index data

THE ESTIMATING DEPARTMENT of Chemical Construction Corp. has come up with an answer to the problem of facilitating the production of an estimate and shortening the time spent in reference work—a chemical cost slide rule.

Since the problems of cost estimating are greatly reduced if an estimate is based on well-organized returned costs from previous work on similar plants, the department has built up a file of coded crossindexed cost information on the wide range of processes such as acetylene, acids, ammonia, methanol, urea, etc.

In preparing an estimate it has been demonstrated that the Nelson Refinery Construction Index (published in the first issue of every month in The Oil and Gas Journal) used as a factor against returned costs produces a figure comparable to the current market. To accomplish this indexing, the department developed the slide rule known as the "Chemico Cost Projector."

The scales of the projector are a plot of the Nelson Construction Cost Index, the various components of it, as well as some of the most useful of the indexes that are prepared by W. L. Nelson, the Journal's technical editor, and published in the quarterly Itemized Cost Index page of the Journal. (First issue in the months of January, April, July, and October). These enable the user to directly factor any known cost of the many general classes of equipment listed to a specific date for comparison of costs or to the current date. Centrally located are scales based on the "Six-Tenths Power Factor," by means of which the user can immediately determine the cost of units of different sizes based on known costs and capacities.

The accompanying examples illustrate the use of the rule:

Examples . . .

1. **A 150-ton/day plant cost $1,500,000 to erect in 1950. Find the cost of the plant in 1956.**

   Solution:

   Set indicator at $1,500,000 on Scale A, align 1950 mark on "Material & Labor" scale with indicator, move indicator to 1956 mark on "Material & Labor scale and read $2,000,000 on Scale A.

   Answer—$2,000,000.

2. **Find the cost of a similar type plant as above with a 300-ton/day capacity in 1956.**

   Solution:

   Repeat solution above maintaining indicator position on "A" Scale ($2,000,000). Revolve inner scale to align 150 T/D in window with 300 T/D on scale below window. (Note that capacity ratio of 1:2 has been set up at window scales.) Read $3,030,000 on "B" Scale at indicator.

   Answer—$3,030,000.

3. **A 700-sq.-ft. straight tube kettle reboiler, 150 psig., costs $5,500—Find the cost of the reboiler if the surface were 1,250 sq. ft.**

   Solution:

   Find capacity ratio by setting 700 sq. ft. on "A" Scale over 1,250 sq. ft. on "B" Scale. At index of "A" Scale read 1.785 on "B" Scale, therefore the ratio of first capacity to second capacity is 1:1.785. Set this ratio on window scale. At $5,500 (known cost) on "A" Scale read $7,780 on "B" Scale.

   Answer—$7,780.

(Chemical Construction Corp., 525 West Forty-third Street, New York 36, has a number of copies of the rule on hand and will send one to readers who make the request on company letterhead. The company reserves the right to invoice at $2.00.)

Here's a brief report on how a new

890-960 Mc. Communication System

has performed for Continental Co.

By M. L. Hall
Continental Pipe Line Co.

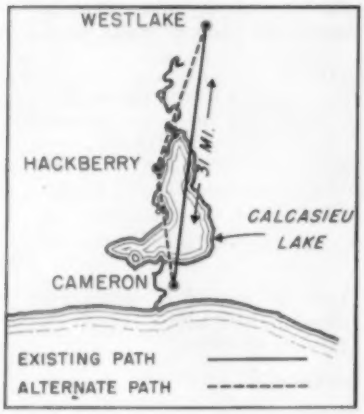


Fig. 1

What the author says about this new method . . .

The 890-960-mc. frequencies and RF equipment definitely possess features which are highly desirable for certain applications. Among these features are the following:

1. Noncritical tower requirements (using open grid, parabolic antennas).
2. Noncritical antenna alignment due to broad half power points.
3. Small rack space (see Fig. 6 showing an RF terminal with duplex service channel and provisions for seven-channel mod-demods on one 72-in. equipment rack).
4. Excellent propagation reliability using lower frequencies.
5. Simplicity of maintenance since only radio-type test equipment is required.
6. Transmission-line losses are relatively low due to lower frequencies, thus permitting use of economical coaxial cable.
7. Economically applicable to systems with relatively low channel requirements.
8. Readily adaptable to weatherproof cabinets.
9. Economically applicable to high-density systems for spurs.

THE SYSTEM consists of one hop 31 miles in length between Lake Charles, La., and Cameron, La., with antenna heights such that a midpath clearance of only 30 ft. was attainable. Approximately one-half the path length (15 miles) is over one body of water, Lake Calcasieu (see Fig. 1).

The decision to attempt operation of a multichannel communications system under such adverse route conditions was not supported by the figures obtained from path calculations. In fact, calculations indicated that obstruction loss reduced fade margin to the point that reliable propagation was highly improbable, especially in view of the area involved and the fact that 15 miles of the path was over an inland lake.

The decision to attempt the long, one-hop system was supported by the fact that in the event propagation difficulties were encountered, a repeater could be installed in the vicinity of Hackberry, La., located on the west shore of Lake Calcasieu (see Fig. 1). This would decrease obstruction loss, increase fade margin, reduce overwater path lengths, and utilize natural masking of path reflections.

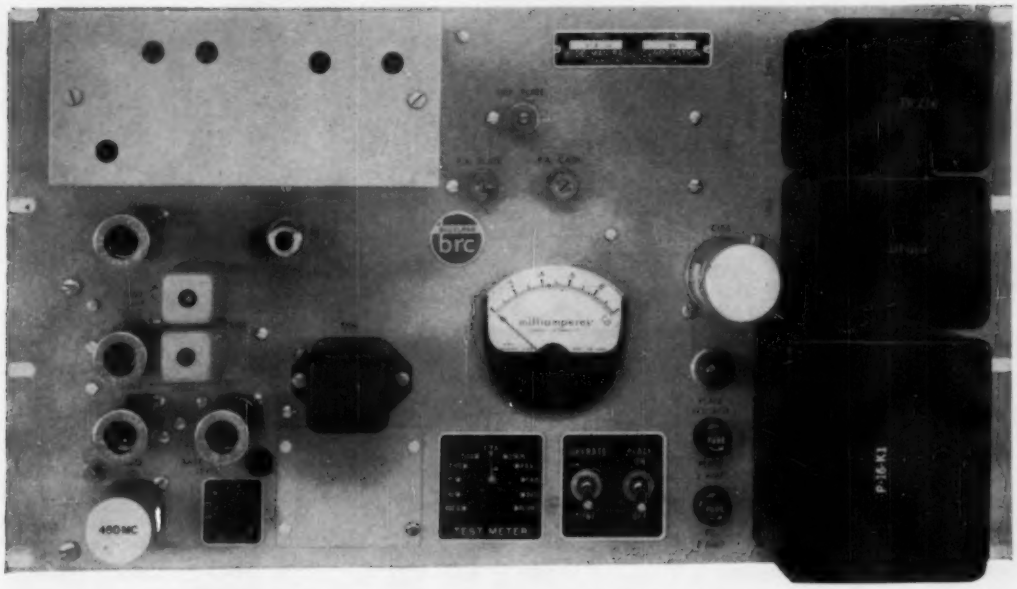
RF Equipment

The RF equipment used is a production model. The prototype was installed several years ago and operated on an experimental basis in the Louisiana coastal area for approximately 1 year by an independent telephone company.

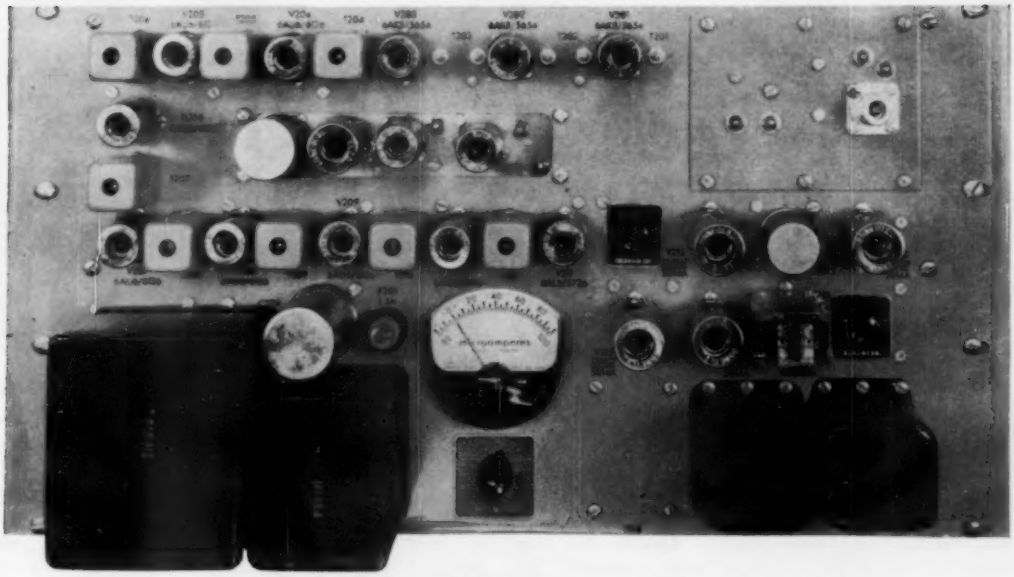
The RF transmitters operate on 895 mc. at Lake Charles and 910 mc. at Cameron. Modulation of the transmitters is phase-frequency with plus or minus 200 kc. maximum deviation. Transmitters are crystal-controlled, utilizing the 216th multiple of the crystal at the power-amplifier output. The third tripler and final amplifier utilize type 5876 pencil triodes, which are cooled by convection. Power output of the final amplifier is 2 watts. Fig. 2 shows the RF transmitter with self-contained power supply and built-in metering.

The RF receivers used are double-conversion type, utilizing temperature-controlled quartz crystals to establish their operating frequencies. Fig. 3 shows the RF receiver with self-contained power supplies and built-in metering. Noise figure of the receivers is better than 12 db. Sensitivity is 3.0 μv. for 20-db. quieting. Base-band output level is minus 10 dbm. for plus or minus 25 kc. swing.

The transmitter and receiver are packaged in such a manner that



RF TRANSMITTER with self-contained power supply and built-in metering. Fig. 2.



RF RECEIVER with self-contained power supply and built-in metering. Fig. 3.

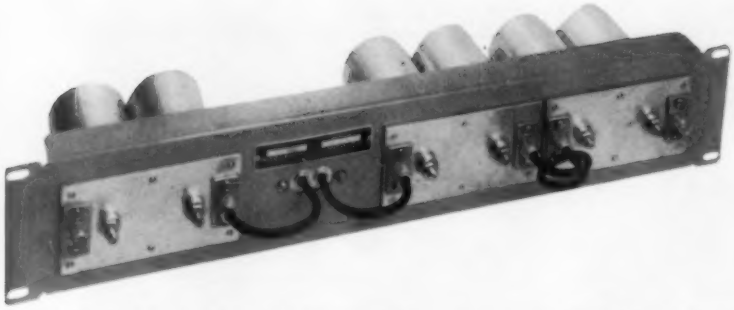
servicing is convenient since both the back and front are readily accessible. An additional feature which aids maintenance is the built-in metering facility in both the transmitter and the receiver.

The transmitter and receiver are operated from a common antenna with 15 mc. spacing through the use of the diplexer shown in Fig. 4. The diplexer used on the system is tuned for 15-mc. transmitter-receiver separation; however, a separation of 10 mc. can be used with slight desensitizing of the receiver, thus permitting use of closer frequency spacing in congested areas.

Multiplex Equipment

Multiplex equipment used on the system is double side-band, crystal controlled, AM-type equipment, utilizing 10-kc. spacing between channels. This type of equipment does not conserve base band from the spectrum standpoint or yield minimum system loading. But it does provide a simple and inexpensive channelizing technique for a limited number of channels, which in this case will probably not exceed six to eight channels within the next 5 years.

When the channels approach the maximum usable number provided by the double side-band equipment, single side-band equipment can be substituted, thus realizing increased channel capacity. To date, the system has been used only for telephone communications and VHF base-station control; however, indications are that data and/or control functions will be used on the system in the future. Fig. 5 shows a complete mod-



TRANSMITTER AND RECEIVER are operated from a common antenna through the use of this diplexer. Fig. 4.

demod panel with ring-down facilities and self-contained power supply.

Antennas

Antennas used on the system are 10-ft., multielement-grid, parabolic structures made of arc-welded aluminum. Following are published specifications of the antenna.

Frequency range, mc.	890-960
Diameter, ft.	10
Gain-over isotropic, db.	27
Beam width 3 db. points:	
H plane	7°
E plane	8°
Front-to-back ratio, db.	30
Maximum side lobe, db.	—22
Wind thrust—100 m.p.h., lb.	700
Net weight, lb.	100

The antenna system is constructed of low-alloy aluminum (6063) which is particularly important in coastal areas in view of inherent corrosion problems.

Towers

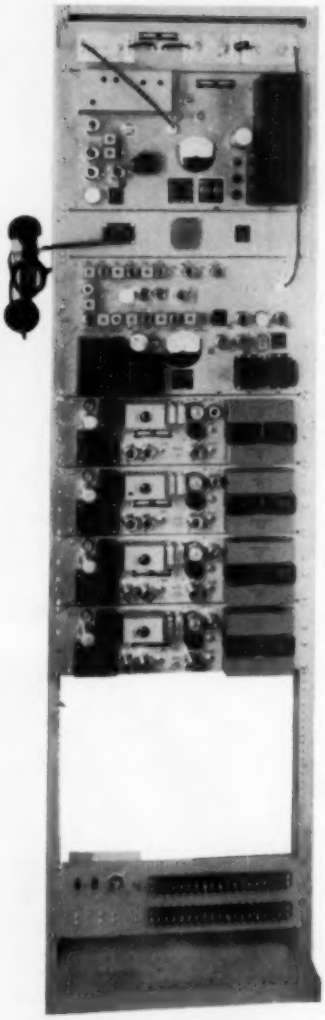
The towers used were existing lightweight VHF radio towers which might appear unwise in view of the 10-ft. parabolic antennas; however, since they are of grid construction the wind loading is drastically reduced as evidenced by the 700-lb. thrust figures of the antenna under 100 m.p.h. wind conditions. Another and more important consideration is the fact that the "E" and "H" planes at the 3-db. points are 8° and 7° respectively. This permits the towers and guys to approach the yield point under adverse wind loading conditions without affecting communications.

The tower located at Lake Charles is 155 ft. high with the antenna located at the 152-ft. level. The tower at Cameron is 280 ft. high with the antenna located at the 260-ft. level. The antenna was located at the 260-ft. level for two reasons: VHF radio antennas were located at the top level which did not permit adequate space for the 10-ft. parabola; and the 260-ft. level had guys connected at that point which permitted a more direct transfer of the wind-loading moment to the guys.

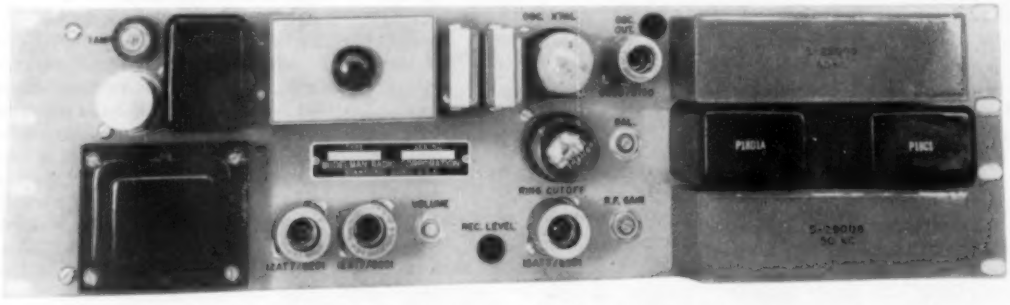
Preinstallation Tests

The equipment was assembled and set up in a "back-to back" arrangement at a maintenance headquarters to conduct preinstallation systems tests and to familiarize personnel with the equipment. The back-to-back arrangement proved of very little benefit due to RF coupling between the terminals which dictated separating the terminals by some distance to prevent the coupling. The terminals were separated approximately 200 yd. and connected to loss radiators in order to complete systems tests.

During the tests, the base band was examined for intermodulation using an oscillographic spectrum analyzer and, with the "two-tone" method of loading, the results indicated that the equipment was fully capable of performing within manufacturer's specifications. A much more comprehensive test for intermodulation would have been accomplished using random noise loading.



RF TERMINAL with duplex service channel. Fig. 6.



COMPLETE MOD-DEMOD PANEL with ring-down facilities and self-contained power supply. Fig. 5.

But unfortunately band stop filters and other appurtenances were not available for the particular equipment under test. The equipment was tested for stability under low and high-voltage conditions and performed well within specifications.

Multiplex equipment was tested for noise level and found to perform very well under weighted measurements; however, some 60 and 120-cycle components were found present when unweighted measurements were conducted. The 60 and 120-cycle components are of very little consequence from an operating standpoint since they are not audible; however, they do present a problem in making "drop-to-drop" measurements using a conventional VTVM without weighting. After tests were completed, the equipment was operated continuously for 10 days with periodic tests made for stability. During the 10 days, no indication of instability was noted.

Installation

After all tests, the equipment was transported as assembled terminals some 500 miles to the points of installation. The terminal at Lake Charles was installed first. The antenna was adjusted using the conventional transit method for alignment. Minor adjustments were made on the transmitter and receiver at Lake Charles prior to starting the installation at Cameron.

The station at Cameron was installed and the antenna swung for a maximum field strength reading from Lake Charles which was approximately 30 μv. input to the receiver. An attempt to increase the Cameron limiter reading by swinging the antenna at Lake Charles resulted in no improvement. Signal-to-noise measurements were conducted on the system after all installation was completed. Measurements indicated approximately 40 db. weighted, which is the measurement on the system today after some 6 months of operation.

During the 6 months of operation, communications have not been interrupted once due to propagation variations. There have been only two complete outages, and these resulted from a defective RF choke in a transmitter filament circuit and a defective tube in a receiver. In one instance, the limiter current decreased to approximately 25 μa. but was returned to the original value of 40 μa. by replacing two weak tubes in an IF strip.

Maintenance

Corrective maintenance has been so small and infrequent that it is difficult to ascertain how much attention the equipment would require if the base band were fully loaded, which would necessarily require more stable operation of equipment.

However, from all indications sufficient margin has been designed into the equipment to allow for environmental variables as well as normal aging of components. These, for the most part, are the two items which determine the amount of attention required. All test measurements are made on a d.c. basis using the built-in meters which eliminate the need for elaborate test equipment when performing routine maintenance.

Personnel who maintain the system are radio and wire-line carrier technicians who have not had previous microwave maintenance experience. Since the RF system and multiplex system are very similar to radio and wire-line carriers, they have had no trouble maintaining the system.

Frequency Assignment

Frequencies used on the system described are within that portion of the spectrum in which industrial heating, etc., are operating and are naturally subject to interference; however, to date, no interference has been encountered.

Merry Christmas KELCO *Happy New Year*

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MAKING BUTADIENE—5

Feed Preparation and Finishing by furfural extractive distillation

In this concluding section on butadiene processing the use of furfural extractive distillation is reviewed: (1) when butylene is feed stock, and (2) when butane is the feed. The C_4 separation processes in commercial use are summarized. The use of UV and IR analyzers-controllers in furfural processing is covered.

By John C. Reidel
Petrochemical Editor

A PROCESS SCHEME was shown in Fig. 5 of Part 4 of this report, which uses acetone for concentration of butylene and CAA for butadiene extraction. In that scheme the whole B-B stream went through the isobutylene removal section. The n-butenes were then separated from butanes by acetone (or acetonitrile) extractive distillation.

In handling the feed by furfural extractive distillation, as shown in Fig. 6, a split is first made in the prefractionator and only the overhead from this column goes through the isobutene removal. When a B-B stream is being handled the split will be between butene-1 and n-butane. For feed preparation the extractive distillation with furfural can be made in two steps: (1) to separate isobutane and butene-1, and (2) to separate n-butane and the butene-2's. Furfural extractive distillation is then used once again in the butadiene finishing to separate butadiene from butene-1.

When the feed for butylene dehydrogenation is obtained from dehydrogenation of butane, the split in the prefractionator or butylene splitter (butene-1 column in Fig. 7) would be between butadiene and n-butane.

The arrangement of furfural extractive distillation steps, where there is a tiein between butane and butylene dehydrogenations as practiced by Petro-Tex, was indicated in Fig. 4 (Part 3).

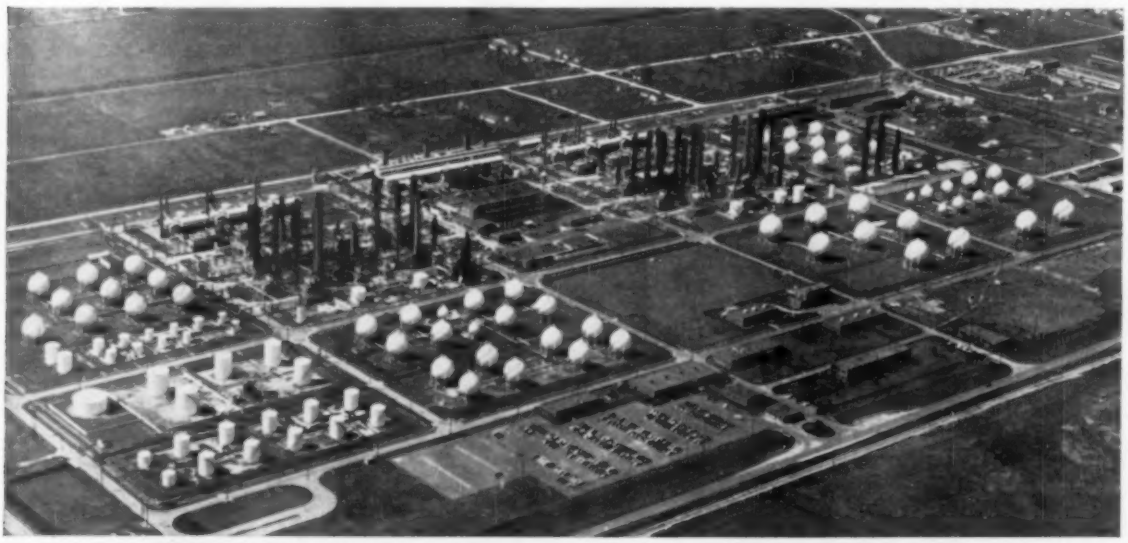
1. FURFURAL EXTRACTIVE DISTILLATION

Fig. 6 shows the major steps in one process scheme employing furfural extractive distillation for feed prep and butadiene finishing. Happel[30] has given a detailed description of the process as employed at the Neches Butane Products plant. Recoveries of up to 90 per cent of the butenes in the hydrocarbon feed are possible in feed prep, and butadiene recoveries up to 98 per cent in butadiene concentration.

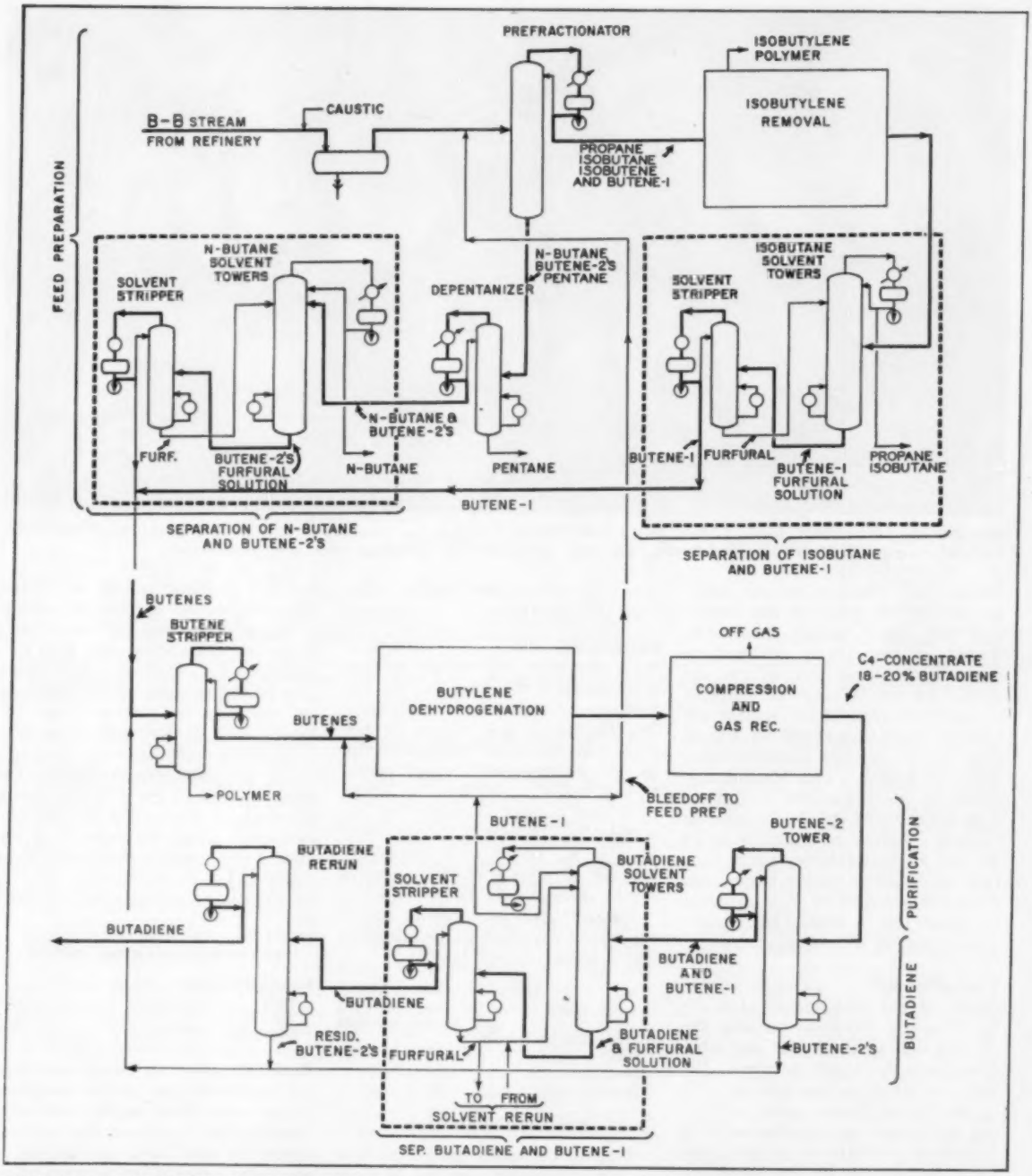
Feed Preparation

The refinery B-B stream is caustic washed to remove sulfur and sent to the prefractionator. This column makes the split between butene-1, isobutylene and isobutane (overhead), and the butene-2's and n-butane (bottoms). The overhead goes to isobutylene removal. The bottoms are depentanized.

Isobutane solvent towers . . . The effluent from the isobutene - removal



WORLD'S LARGEST BUTADIENE PLANT, Neches Butane Products Co. at Port Neches, Tex., is owned jointly by Texas-U. S. Chemical and Goodrich-Gulf. Present capacity is 220,000 tons of butadiene per year. Plant will be expanded to 300,000 tons annually. Furfural extractive distillation is employed at this plant.



FURFURAL EXTRACTIVE DISTILLATION. Typical process scheme when employing furfural extractive distillation for butylene concentration and butadiene finishing. Fig. 6.

section consists mostly of isobutane and butene-1 with some propane and a small amount of n-butane. In the isobutane solvent towers extractive distillation with furfural separates the butene-1. The furfural-butene-1 solution goes to the stripper from which butene-1 is the overhead product and lean furfural is recycled. The isobutane is rejected overhead at the solvent tower, with the propane and n-butane and returned to the refinery.

n-Butane solvent towers . . . The overhead from the depentanizer, consisting of n-butane and butene-2's, is charged to the n-butane solvent towers. The relative volatility between n-butane and trans-butene-2 averages around 1.6 in presence of furfural. n-Butane is rejected overhead and returned to the refinery. Butene-2's are absorbed in furfural. The rich solvent is stripped and lean solvent from the bottom of the stripper recycled. The butene-2's overhead from the stripper and the butene-1 overhead from the stripper in the isobutane solvent tower section are taken to intermediate storage or to the butene rerun tower.

100-plate units . . . Only one solvent tower is shown in Fig. 6 for the iso-

BORGER INSTALLATION. Butane is feed stock for the Phillips Chemical Co. butadiene facilities located in the Texas Panhandle. Furfural extractive distillation is used following each stage of the two-stage dehydrogenation process at Borger.

butane and n-butane solvent units, due to lack of space on this simplified flow sheet. Actually these units consist of two towers operated in series in the same way as was described for the "A" and "B" butylene extractor columns in the acetone extractive distillation shown in Fig. 5 (Part 4). To separate between isobutane and butene-1, two 50-plate columns, 13 ft. in diameter by 140 ft. high, are operated in series; to separate between n-butane and the butene-2's the two 50-plate columns which have been employed at Neches Butane and Petro-Tex are each 10 ft. in diameter by about 140 ft. high. The strippers are smaller, 20-tray columns.

Plate efficiencies . . . Gerster et al.[42] report on the performance of a 13-ft. diameter 100-plate furfural distillation unit separating iso and n-butanes from the 1 and 2-butenes. The unit was placed in operation in 1953 at the Neches Butane plant, employing tray design as recommended by University of Delaware to give good vapor distribution for the conditions of high liquid loading and low vapor throughputs as encountered in furfural extractive-distillation columns.

In the 50-tray rectifying section (corresponding to the "A" column in the butylene extractor unit of Fig. 5) plate efficiencies for the isobutane-butene-1 separation were constant at 20 per cent. In the stripping section (corresponding to the "B" column of Fig. 5) plate efficiencies varied from 25 to 45 per cent. Average plate efficiency for the entire column was 25 per cent. However, Phillips is reported to achieve considerably higher plate efficiencies.

Furfural-HC ratio . . . For the separations shown in Fig. 6 the furfural is circulated in the tower at a solvent-feed ratio of about 10 to 1 by volume. The furfural is fed at four or five trays from the top of the first section or "A" column and a small hydrocarbon reflux is employed to knock back the furfural (volatility of the furfural is sufficient to carry it overhead if no reflux were employed). Amount of reflux is regulated according to furfural inlet temperature.

Happel[39] gives the following figures for typical operation in the isobutane and n-butane solvent towers:

	Solvent towers	
	Iso-butane	n-Butane
Butenes, mole per cent, in:		
Feed	38	51
Overhead	5	3
Bottoms	95	95

Butadiene Purification

Feed to the butadiene purification section, containing some 18-20 mole per cent butadiene, enters the butene-2 tower. Here most of the butene-2's come out as bottom product. Overhead product is butadiene, butene-1, and some butene-2's.

Butadiene solvent towers . . . The butene-2 tower overhead is fed to the butadiene solvent towers where furfural extractive distillation is employed to take out the butadiene and some butene-2's, while the butene-1 overhead is returned to the dehydrogenation section. A small portion of butene-1 overhead is bled off to the feed-prep section to prevent buildup of diluents (n-butane and isobutylene) in the dehydrogenation feed. Rich furfural from the butadiene solvent tower goes to the stripper where butadiene and some residual butene-2's are removed, and the lean solvent recirculated to the solvent towers.

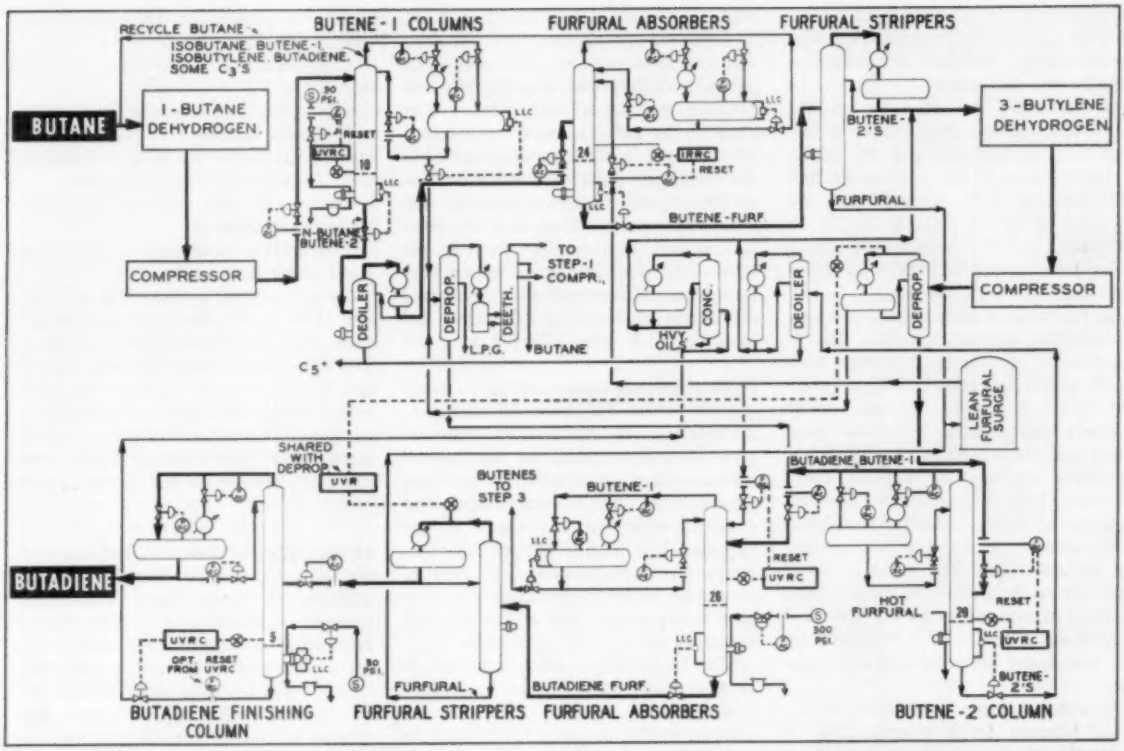
The butadiene solvent tower section again consists of two 50-plate towers operated in series. The solvent circulation is about the same as in the other two extractive distillation units shown in Fig. 6—in the order of 10/1 by volume. A typical split is given[39] as:

BUTADIENE SOLVENT TOWER

Butadiene, mole per cent in:	
Feed	28
Bottoms	85
Overhead	1.5

Butadiene rerun . . . The solvent stripper overhead goes to the butadiene rerun tower. Here specification butadiene is taken overhead. The residual butene-2's and traces of acetylenes, etc., are removed as bottoms. The butene-2's from the butene-2 column and the residual butene-2's from the butadiene rerun are combined with the butenes from the feed prep section and go to the butylene stripper (butene rerun) column for removal of polymer oils and traces of furfural.

Furfural purification . . . A sidestream (about 1-2 per cent) of furfural goes to the furfural rerun plant which is common equipment between the feed-preparation and butadiene - purification sections. This is operated as a



USING STREAM ANALYZERS-CONTROLLERS. How UV and IR analyzer-controllers are employed in furfural extractive distillation in the Phillips butadiene plant at Borger, Tex. Fig. 7.

continuous distillation plant to remove polymers and water that build up in the furfural. It may consist of a furfural drier to separate water and polymer from furfural; furfural and water strippers; a furfural-recovery tower to recover butenes from oil-furfural mixture; and a water wash tower to scrub furfural from oil-furfural mixture.

2. SUMMARY ON SEPARATION PROCESSES

As noted earlier, Dow Chemical Co. employed azeotropic distillation with ammonia to separate butadiene from butenes. This was used for a feed containing a relatively high amount (50 per cent) of butadiene. The disadvantage of this method is that the high latent heat of ammonia results in high heat load and large tower diameter. For lower butadiene concentrations the disadvantage becomes even more marked. Poffenberger et al.[3] stated that this method was operated successfully with feeds as low as 35 per cent butadiene. Below that cost of steam goes up and capacity of the unit goes down. So that 35 per cent butadiene in feed is the approximate economic limit for this method and it has therefore not found application in today's major butadiene plants.

Advantages and disadvantages of the separation methods in large-scale use today may be summed up as follows:

1. **Acetone and furfural** are both satisfactory selective solvents for separation of butenes and butanes in feed preparation. For both methods, to prevent flooding, the columns must be operated so that no phase separation occurs.

- Tray efficiencies are lower with furfural since this has a higher viscosity than acetone. This can lead to the conclusion that fewer trays may be required, for a given separation, with acetone; or a somewhat sharper separation or lower solvent circulation ratio may be possible with acetone for the same number of trays. However, furfural gives a better α value, so the higher tray efficiency of acetone will not necessarily give fewer trays for a given separation.
- Acetone has a low boiling point, forming azeotropes with the C_4 hydrocarbons. This leads to loss of acetone overhead despite the hydrocarbon reflux employed and the provision of a solvent retention zone at the top of the column. The appreciable overhead loss of acetone requires water-wash towers to recover acetone, which is not necessary with furfural. However, the furfural extractive distillation requires somewhat larger fractionation facilities.
- When employing 4-6 weight per cent water with the furfural and at least 18 weight per cent water with the acetone, the capacities of these solvents for the hydrocarbons are about the same. (It would take at least 18 per cent water in acetone to bring the solubility for butane—which is what counts—down to 95 per cent furfural.)

2. **Acetonitrile** extractive distillation for concentration of butenes has the advantage of giving a greater increase in relative volatilities of the C_4's than does acetone. However its cost is about $0.45 per lb. compared with about $0.08 per lb. for acetone.

- Acetonitrile has a higher boiling point than acetone, requiring a larger reboiler for the butylene stripper. The acetonitrile leaves the bottom of the stripper at about 40° F. higher than acetone.
- So far Shell experience (the switch at Torrance was made in August 1956) with acetonitrile has been as satisfactory as that with acetone and has given Shell a boost in feed-prep capacity from 2,100 to 3,000 bbl. per day while utilizing existing columns and at a cost of only about $150,000 for revamp.

3. **Cuprous ammonium acetate** solution exhibits high selectivity for butadiene and is therefore used to advantage for butadiene extraction since a relatively small number of

equilibrium stages are required. Operation in a countercurrent mixer-settler system can give extraction efficiencies close to the theoretical.

- However, the capacity of the CAA solution for butadiene is less than that of furfural and the effect of temperature is the reverse of that with furfural. Low temperatures are required to obtain suitable butadiene solubility, but the solvent-feed circulation ratio is not too different from that required with furfural.
- Furfural is well suited not only to butylene purification but also to purification of butadiene streams with 20-40 mole per cent butadiene content. CAA is based on formation of addition compounds. Therefore both CAA and furfural can handle richer butadiene streams as well as those relatively low in butadiene. The advantage of CAA is on leaner butadiene streams. For the leaner streams the solvent circulation ratio is lower with CAA than with furfural. Also, furfural cannot make the cis. butane-2 /butadiene separation; it must rely on the associated conventional fractionator.
- CAA solution is not used to separate butenes from butanes due to the relatively low solubility of olefins in this solution. For extraction of butadiene from Houdry butane dehydrogenation product, when no separation is required between the butanes and butenes, CAA may be employed to advantage. This was one reason for choice of this method by Firestone, for example. In this case, choice of CAA resulted in reduced investment cost.
- More auxiliary equipment is required with the CAA process for the preparation and purification of the cuprous ammonium acetate solution.

3. CONTROL ON COMPOSITION

Some critical problems arise in furfural extractive distillation column operation.

Flooding . . . Possible flooding of the bottom section of the solvent tower has been mentioned. The hydrocarbon phase has a much lower gravity than the furfural-water phase. Also operation is conducted at the higher proportion of hydrocarbon dissolved in solvent (close to the solubility limit of hydrocarbon in furfural water) to obtain best separation. These two factors can cause separation of a liquid hydrocarbon phase on the trays below the feed plate and lead to flooding. Control of the amount of dissolved hydrocarbons is obtained by setting up the proper relation between temperature of solvent feed to column and the hydrocarbon reflux rate.

One way of doing this has been to hold solvent temperature constant and let reflux rate vary. A small temperature differential was maintained between the top of the column and a reference point several trays below the furfural inlet. (As this reference tray becomes saturated with hydrocarbon its temperature approaches the top temperature.) Therefore the lowest possible differential—that at incipient flooding of the rectifying section—was determined and the actual differential was ordinarily maintained at some 5° F. above this.[37]

Control solvent temperature . . . Since a high solvent-HC ratio is employed, a large part of the heat requirement goes to sensible heat of the solvent mixture flowing down the column. This means that solvent temperature requires close control since a few degrees drop in this temperature can result in large amount of internal condensation of hydrocarbons and so give a rapid increase in the internal reflux in the rectifying section.

The furfural temperature is held as high as practical (higher solubility). For a given dissolved hydrocarbon content in the column, the maximum possible external hydrocarbon reflux is maintained to obtain maximum separation and facilitate control.

Controlling reboiler heat . . . This may be varied to maintain the desired split. One method is to make hourly analyses of the hydrocarbon vapor at an intermediate tray in the bottom section of the solvent column. Correct composition (by experience) is maintained to give the desired separation. As will be discussed later, Phillips replaced such periodic analysis with continuous analysis by UV and IR stream analyzers, which automatically control the columns. The newer butadiene installations, such as Texas Butadiene & Chemical, also employ UV and IR analyzers.

Stripper control . . . The stripper reflux is controlled on temperature at a point just above the furfural inlet. Temperature of the furfural may be as high as 315° F. in the solvent strippers.

Employing Stream Analyzer-Controllers

Fig. 7 shows how furfural extractive distillation is employed by Phillips Chemical Co. in conjunction with the butane and butadiene dehydrogenation facilities in the Plains butadiene plant at Borger.

Phillips has developed stream-analysis instrumentation for continuous record and control. As indicated in Fig. 7 ultraviolet on-stream recording controllers are used on:

1. Butene-1 columns (the prefractionator of Fig. 6).
2. Butene-2 column.
3. Furfural absorbers (solvent towers) in butadiene purification section.
4. Butadiene finishing column.

On-stream infrared recording controllers are used on:

1. Furfural absorbers in butylene purification section.

In these applications the UVRC and IRRC controllers are used in cascade with flow-recording controllers. The UV and IR analyses provide the sensitive detection required to indicate critical changes in composition of the C_4 streams. As plant instruments they provide near instantaneous sample analysis and a continuous record.

Phillips process flow . . . Referring to Fig. 7, the butane dehydrogenation effluent is compressed and goes through conventional gas recovery consisting of absorption with 220 mole weight oil followed by stripping. The C_4 stream then goes to the butylene purification section where separation is made by straight fractionation in the butene-1 columns between a predominantly butene-1 stream (also containing isobutane, isobutylene, butadiene and some C_3's) in the overhead and n-butane and butene-2's in the bottoms.

These bottoms go to a deoiler where C_5-plus is removed and then to furfural extractive distillation (furfural absorbers in the butylene purification section) where the separation is made between n-butane and butene-2's. The overhead from the butene-1 column goes to a depropanizer and the overhead from the depropanizer to a deethanizer. Following removal of C_3 and isobutane, the butene-1 stream (bottoms from the depropanizer) with some isobutylene and butadiene is sent to the butadiene purification section.

Butylene dehydrogenation effluent, following compression and gas recovery in facilities quite similar to those employed for the butane dehydrogenation effluent, goes to the butene-2 column where separation is made by straight fractionation into butadiene and butene-1 overhead and predominantly butene-2's bottoms. This bottoms stream goes through a deoiler and is recycled to butylene dehydrogenation.

The overhead from the butene-2 column, together with the depropanized overhead from the butene-1 columns goes through furfural extractive distillation (furfural absorbers in butadiene purification sec-

tion). Liquid furfural flows countercurrent to the vapor hydrocarbon feed extracting butadiene. Butene-1 is rejected overhead. Butadiene is stripped from the butadiene-furfural bottoms stream and goes to the butadiene-finished column.

UV analyzers. Some details concerning these analyzers, the sampling system, sample switching arrangement, etc., are given by Campbell and Godin.[40] Typical column feed, overhead and bottoms compositions are given by these authors.

1. **Butene-1 columns.** There are two 100-tray, 12-ft.-6-in.-diameter columns. In each of these columns vapor samples from the tenth plate (numbered from bottom) are analyzed alternately for butadiene by a single recording UV spectrophotometer located in the plant control room. Solenoid valves are used to switch between the two column samples and to switch controlled air going to the pneumatic set mechanisms of the FRC's on each column. By thus monitoring the butadiene going to bottoms (keeping butadiene concentration at the tenth plate below 0.5 per cent) losses of butene-1 and butadiene in bottoms are held to the desired minimum. The butene-1 column control in Fig. 7 shows the UVRC resetting FRC on steam to column heater. A similar reset could be used to control either reflux or overhead product rate.

2. **Butene-2 column.** A single 100-tray, 12-ft.-diameter column is employed. Since the overhead product from this column is held constant as indicated in Fig. 7, composition of the bottoms then varies in accordance with changes in the feed composition. On this column a vapor sample from the twentieth tray is analyzed and the UVRC resets the FRC on the feed to the column. This maintains a constant, low-butadiene concentration in the bottom product by controlling according to the analysis of the twentieth-tray sample. Optimum range of butadiene concentration at this point is about 8-10 per cent at maximum production rate.

3. **Furfural absorbers** (butadiene purification section). Separation between butadiene and butene-1 takes place in 100-plate, 12-ft.-diameter furfural absorbers. It is most critical here that a very low concentration (not over 1 per cent) of butene-1 be maintained in the furfural absorber bottoms since any butene-1 going over to the butadiene finishing column cannot be separated by straight fractionation there. Also loss of butadiene in the furfural absorber overhead must be kept low. To meet these two requirements an inverse correlation between butadiene and butene-1 concentrations was established. A vapor sample from the twenty-sixth tray is analyzed. (When vapor from this tray runs between 45-55 per cent butadiene, the requisite low butene-1 content in bottoms can be maintained.)

Note has already been made of the difficulties in operating such columns due to sensitivity to changes in furfural inlet temperature and tendency to column flooding. The control scheme indicated in Fig. 7 is to reset the FRC on furfural solvent feed to the absorber. An alternate method is to reset the FRC on steam on the column heater.

4. **Butadiene finishing column.** This is a 9-ft.-diameter, 120-plate column in which butene-2's and acetylinic compounds are removed to make 98 per cent or better butadiene overhead containing under 0.1 per cent acetylenes. Loss of butadiene in bottoms is held to a minimum. Continuous analysis of a vapor sample from the fifth plate, running at 3-4 per cent apparent butadiene, is employed and the FRC reset to control rate of bottoms withdrawal accordingly. Butadiene in bottoms product is kept at 0.5 per cent or below. This method of control permits recycling of the butadiene finishing column bottoms back to butylene dehydrogenation rather than to the butene-2 column. The latter practice was formerly necessary due to periodic buildup of butadiene content in this stream.

IR analyzer . . . The use of IRRC on the furfural absorbers in the butylene purification section is discussed by Berger and Campbell,[41] who give

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on stream in the United States

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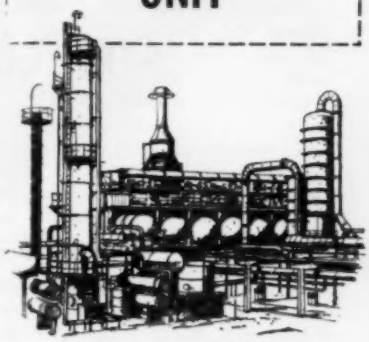

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typical compositions involved in this operation. The furfural absorber here is a 100-plate, 13-ft.-6-in.-diameter column operated in two 50-tray sections as are the other 100-plate columns referred to above. Here n-butane is rejected overhead and concentration of butenes in the overhead must be kept to a minimum. A vapor sample from the twenty-fourth tray is analyzed. Normally loss of butenes in overhead is only 1-2 per cent if concentration of butenes in the twenty-fourth plate vapor space is held between 20-25 per cent.

Before installation of the on-stream IR analyzer, periodic bromine-Orsat analysis was employed and the steam rate to column heater adjusted accordingly. Control was unsatisfactory due to fluctuations of the butene-content from the desired range during the periods between bromine-Orsat analyses. The result was either high butane content in the butylene dehydrogenation feed or excessive olefin carryover in the furfural absorber overhead. In present operation the IRRC resets the FRC on the lean furfural feed to column.

Monitoring depropanizers . . . Note also in Fig. 7 that one UV analyzer cyclically samples each overhead stream from the depropanizers. By continuously monitoring the amount of butadiene being lost overhead in each depropanizer a guide is provided for periodic adjustment of these columns to keep such loss at a minimum.

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FURFURAL EXTRACTICE DISTILLATION

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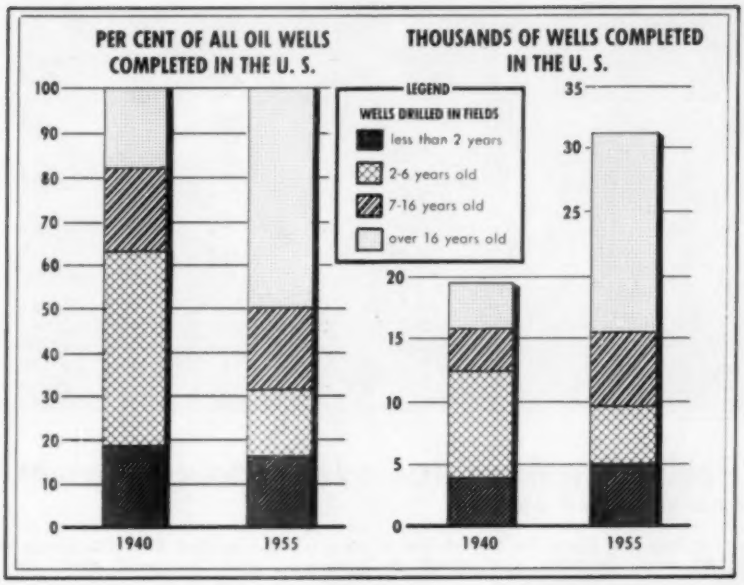

Development-drilling program has gradually altered as . . .

Fracturing has changed pattern of U. S. drilling. Low exploration costs make old fields attractive prospects

A RADICAL CHANGE has occurred in the development - drilling program in the United States since 1940. Then only 18 per cent of the development wells were punched down in old oil fields. In 1955, however, at least 50 per cent of all field drilling took place in old oil fields, those discovered prior to 1940.

What has caused this change in the drilling pattern? Probably the biggest single factor can be traced directly to fracturing. Even today, 80 per cent of all wells are fractured before completion. Rising costs of oil finding make it profitable to reevaluate old oil fields where drilling risks are low, leases cheap, and there is an abundance of subsurface information.

Survey results . . . Tables 1 and 2 showing these data by states indicate that most of the states follow the trend shown by the total. In the following states the per cent of completions in fields 16 years old or less went down from 1940 to 1955; Louisiana, Texas, Indiana, Michigan, Illinois, Arkansas, New Mexico, and Mississippi. In the states of Oklahoma and California the figure did not change very much. Probably this is because both of them had reached an advanced stage of development in 1940, and have not changed much in the last 15 years. The Rocky Mountain states, in general, are contrary to the over-all trend. Nebraska, Colorado, and South Dakota show essentially 100 per cent of the drilling in fairly new fields.

Of course, this is because their only significant oil fields have been discovered in recent years. Montana and Wyoming show increases from 1940-1955. The reason for this is that they were developing primarily old fields in 1940, but new discoveries since then have shifted the development into newer fields. The present and prospective drilling programs in the Rocky Mountain states certainly are not nearly large enough to make it likely that the trend shown in these figures will be reversed in the near future.

TABLE 1—DISTRIBUTION OF 1955 OIL WELL COMPLETIONS IN THE PRINCIPAL PRODUCING STATES*

State	Total oil well compl.	1940-49 Discs. Oil wells	1940-49 Discs. % of total	1950-55 Discs. Oil wells	1950-55 Discs. % of total	1954-55 Discs. Oil wells	1954-55 Discs. % of total	1940-55 Discs. Oil wells	1940-55 Discs. % of total
Arkansas	442	191	43.2	174	39.4	112	25.4	365	82.5
California	1,710	329	19.2	570	33.3	182	10.6	899	58.5
Colorado	406	2	0.5	406	100.0	298	73.5	406	100.0
Illinois	2,099	832	39.6	282	13.5	172	8.2	1,114	53.2
Indiana	223	93	41.7	66	29.6	12	5.3	159	71.4
Kansas	2,261	653	28.9	1,125	49.7	683	30.2	1,778	78.5
Louisiana	2,656	370	13.9	621	23.4	253	9.6	991	37.4
Michigan	202	85	42.1	44	21.8	29	14.4	129	63.9
Mississippi	176	68	38.6	79	44.8	42	23.8	147	83.5
Montana	158	14	8.9	99	62.6	24	15.2	113	71.5
Nebraska	300	0	0.0	295	98.4	213	71.0	295	98.4
New Mexico	931	372	40.0	185	19.8	85	9.1	557	59.8
N. Dakota	168	0	0.0	168	100.0	26	15.4	168	100.0
Oklahoma	4,846	908	18.8	968	20.0	639	13.2	1,876	38.7
Texas (†)	9,977	1,022	10.3	3,420	34.3	1,736	17.4	4,442	44.6
Wyoming	383	50	13.1	187	48.8	44	11.5	237	61.8
Total for 16 states	26,234	4,989	19.7	8,689	34.3	4,550	17.3	13,676	54.3
Total for 15 states (Kan. not in.)	23,973	4,336	18.1	7,564	31.6	3,867	16.1	11,898	49.7

*Wells grouped according to discovery year of field in which well drilled. †North Texas omitted—data not available.

TABLE 2—DISTRIBUTION OF 1940 OIL WELL COMPANIES IN THE PRINCIPAL PRODUCING STATES*

State	Total oil well compl.	covered these data	% of total oil wells covered	1925-34 discs. Oil wells	1925-34 discs. % of total	1935-40 discs. Oil wells	1935-40 discs. % of total	1939-40 discs. Oil wells	1939-40 discs. % of total	1925-40 discs. Oil wells	1925-40 discs. % of total
Arkansas	122	119	97.5	19	16.0	97	81.5	30	25.2	116	0.5
California‡	886	886	100.0	113	12.8	437	49.4	50	56.5	550	62.1
Colorado	5	5	100.0	1	20.0	1	20.0	0	0.0	2	40.0
Illinois‡	3,154	3,154	100.0	15	0.5	3,031	96.2	1,152	36.6	3,046	96.7
Indiana‡	300	300	100.0	17	5.7	242	80.8	69	23.0	259	86.5
Kansas†	1,538	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Louisiana	1,208	1,186	98.2	140	11.8	681	57.5	219	18.5	821	69.2
Michigan‡	580	571	98.5	23	4.0	548	96.0	54	94.5	571	100.0
Mississippi	98	98	100.0	0	0.0	98	100.0	98	100.0	98	100.0
Montana	140	135	96.5	80	59.3	0	0.0	0	0.0	80	59.3
Nebraska‡	29	29	100.0	0	0.0	29	100.0	29	100.0	29	100.0
New Mexico‡	499	499	100.0	218	43.7	274	54.9	107	21.4	492	98.6
N. Dakota	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Oklahoma‡	962	962	100.0	235	24.2	130	13.5	60	6.2	365	38.0
Texas	7,107	3,973	55.8	1,373	34.6	2043	51.5	367	9.3	3,416	86.0
Wyoming	111	99	89.2	8	8.1	5	5.1	0	0.0	13	13.1
Total for 15 States (Kan. not in.)	15,201	12,016	79.0	2,242	18.7	7,616	63.4	2,235	18.6	9,858	82.0

*Wells grouped according to discovery year of field in which well drilled.
†There were no usable data for Kansas.
‡Normal method used to gather these data was to take the figure for the number of completions in a field from Oil Weekly, January 27, 1941, and the year of discovery from Petroleum Development & Technology, 1941. In special cases this was not possible and all data were taken from Petroleum Technology.

TABLE 3—DISTRIBUTION OF FIELD WELL DRILLING

	1955	1940
1. Total number oil wells completed in U. S.	31,138	19,773
2. No. oil wells in areas covered	23,973	12,016
3. Per cent coverage	77	61
4. Per cent of all oil wells completed in fields discovered in current and 1 previous year (less than 2 years old)	16.1	18.6
5. Per cent of all oil wells completed in fields discovered in current and 5 previous years (less than 6 years old)	31.6	63.4
6. Per cent of all oil wells completed in fields discovered in current and 15 previous years (less than 16 years old)	49.7	82.0
7. Per cent of all oils wells completed in fields discovered over 16 years ago (by difference)	50.3	18.0

We know that when a fairly large and prolific field is discovered, only a portion of its development occurs in the next year or two. This is because it takes time to go out one offset at a time from the discovery well and develop the field. However, most of the primary development usually has occurred within 5 or 6 years after the year of discovery. For the drilling in any given year it is the fields from 2 to 6 years old that should constitute a very large part of the drilling if discoveries of recent years have been of significant size. The year 1940 was chosen for comparison because we know now that the discoveries in the 5 years preceding 1940 were substantial and this is reflected in the fact that in 1940 about 45 per cent of the oil-well completions were in fields 2 to 6 years old. The comparable figure for 1955 drilling is only 15½ per cent.

This indicates that the discoveries in the last 5 years compare very poorly with the discoveries during the period 1935-1940.

In the chart the percentages have been applied to total U. S. oil-well completions to obtain an estimate of completions by discovery periods. This chart indicates that there were fewer oil-well completions in fields less than 6 years old in 1955 than there were in 1940. This is partly accounted for by wider spacing, but to realize how bad this situation really is, one must remember that the industry averaged about 2500 exploratory wells per year in 1935-1940 and 12,500 wells per year in 1950-1955. This fivefold increase in exploratory drilling apparently generated slightly fewer locations to drill.

Outlook bleak . . . Much of our increased drilling has been in very old fields. However, it is obvious that there is a limit to just how long we can keep on drilling in these older fields. **All of this points out another qualitative explanation of why it is reasonable to expect drilling to decline in the future unless some rather drastic change in the economics of finding and producing oil occurs.**

Lube additives will be made in this new plant of The Texas Co. at its Port Arthur, Tex., refinery. Shown here are the reactor facilities, the fractionation columns, and the storage facilities.

ABC's of Straight-Line Cutting

Here's how to make cuts with a torch . . .

ADJUST the preheat flames to neutral after you have selected the right nozzle and cutting pressure for the plate thickness. (See the instruction folder for the blowpipe you are using.) The inner cones of the preheat flames should be from $\frac{1}{16}$ to $\frac{1}{4}$ in. in length when the cutting-oxygen valve is open. Hold the blowpipe in your right hand to keep constant control of the cutting-oxygen lever.

Balance the blowpipe on your left hand. You can either hold the blowpipe or rest it on your closed fist. Move the blowpipe rapidly along the line of cut to make sure there is enough slack in the hose. Free-hand cutting usually is done from right to left. To preheat, hold the blowpipe with the nozzle vertical. The tips of the inner cones should be close to, but not quite touching, the plate. Center the tips over the edge of the plate on the line of the cut. Preheat a spot until it is a bright red and just starts to melt.

Cutting will start when you slowly press down the cutting-oxygen lever. There will be a shower of sparks from the lower side of the plate. When the cut has started all the way through the plate move the blowpipe forward slowly at a constant speed. The cut should continue to go through the plate without too much oxidation or melting. At the right speed, the stream of sparks will be directed vertically toward the floor.

Don't lose the cut. If you move the blowpipe too fast, the cutting jet will not go through the plate and cutting will stop. When this happens, release the cutting-oxygen lever at once. Reheat the point where the cut stopped to a bright red. Then open the cutting-oxygen valve and restart the cut. When the cut is finished, the cut piece should drop free, but slag sometimes holds the two pieces of plate together. A sharp rap with a hammer will separate them.

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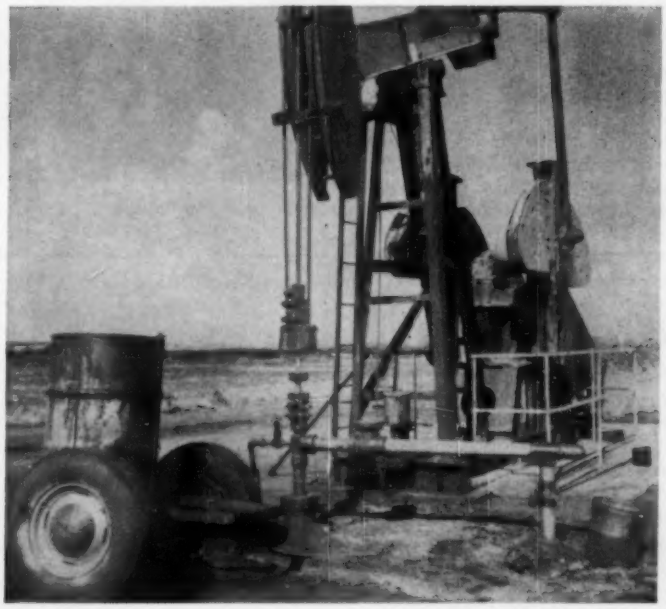
Trailer Speeds Well Tests

WHERE THE PUMPER uses a 55-gal. drum with a mark for exactly 42 gal. for individual well tests, a small trailer will make it easier to move from well to well. The trailer is made by building a frame on the front axle of a junked auto with a tongue made of 2-in. pipe to fit the back of the pumper's car.

When a well is to be tested, the trailer is mounted conveniently near the bleeder outlet on the wellhead and a 1-in. nipple screwed in with an ell looking down into the drum. The drain on the drum is connected back to the casing head so that the water can be measured and used to flush the inhibitor down the casing.

After the test is completed, it is a simple matter to remove the inlet and outlet lines and move the unit to another well.



Here Is Quick Way to Connect, Adjust Guy Wires

ON THE WELL-SERVICING RIGS of Standard Oil Co. of California, working in the San Gabriel field of Los Angeles County, oil men have a quick way of connecting and adjusting guy wires.

The usual deadman is buried at convenient points for the anchor and the male end of a clevis is left just above the ground. When the rig is spotted over the location, the turnbuckles are matched with the hole in the anchor and guy wires slipped in one of the convient knots which are babbited every 2 ft.

A wheel is welded to the moving part of the turnbuckle and can be spun to bring the proper tightness to the guy wires and center the blocks exactly over the hole. The ends of the threaded parts are drilled and a hairpin inserted to prevent turning.

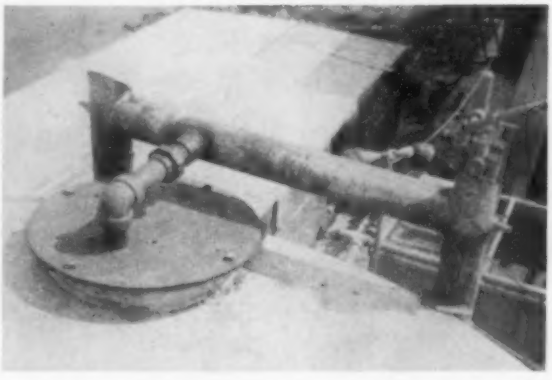
I-Beam Forms Base For Pipe Stands

A NOTABLE method of rigging up a base to stand drill pipe is being used in the Four Corners area of Utah.

The base is made from heavy I-beams set 2 in. apart. The welder is putting on the sides of angle iron which hold the ends together and at the same time form a bed to lay the oak planks on which the drill pipe is set.

After the angle irons are welded clear around the frame, the 3-in. oak planks are installed. When the planks become worn, they can easily be turned over and later replaced without using any tools other than a bar with which to pry them out.

Skid-Frame Construction



Where water tanks are to be moved from one location to another, a simple means of hooking them up is used. The skids are made of 3-in. pipe and welded to the side of the tank so that the tank can be easily loaded and unloaded. A ladder is built into the left side of the frame from sucker-rod material and a connection is made near the bottom for the inlet line from the water supply.

At top, a 2-in. collar with a union is welded to the frame and connected to the top of a manhole plate as shown. This allows the skid base to be used for a ladder and also as a filler line.

Canadian expansion booms as construction of plants for Quebec area planned

Your refinery construction report regularly appears in the last Journal issue of each month. It appears here, 1 week early, since the next issue is the International number.

● **British Petroleum, Ltd.,** will build a $30,000,000, 30,000-bbl. per day plant at Ville d'Anjou, Quebec. It will include a 15,000-bbl. per day catalytic cracker, a 9,000-bbl. per day catalytic reformer, a hydrogen-treating unit, and an alkylation unit.

● **California Oil Co.** will complete in 1959, a 10,000-bbl.-daily UOP Unifining-Platforming unit at Perth Amboy, N. J. **H. K. Ferguson Co.,** contractor, will start construction of the unit spring 1958.

● **Canadian Petrofina, Ltd.,** will increase capacity 50 per cent to 30,000-bbl. per day at Montreal. The $3,000,000 project will be completed mid-1958.

● **Cities Service Oil Co. (Pa.)** will build a 14,000-bbl.-daily asphalt plant to replace existing facilities at Linden, N. J., in 1958.

● **Commerce Oil Refining Corp.** will complete mid-1959, a $48,000,000, 43,000-bbl.-daily plant at Jamestown, R. I. It will include UOP catalytic cracking, Platforming, Unifining, Penex polymerization, and other processing units. Some original process planning was done by **Lummus Co.** Construction contract is held by **Fluor Corp., Ltd.**

● **Gulf Oil Corp.** will increase Platforming capacity 52,000 bbl. per day at Philadelphia in 1958. Engineering and design are by **Procon, Inc.,** and **Universal Oil Products Co.**

● **Irving Oil Co.** plans a refinery at St. John, N. B.

Shaded portion of map is area covered in this survey.

● **R. I. Refining Co.** plans a refinery at Tiverton, R. I.

● **Seminole Oil Co.** has indefinite plans for a refinery at Fort Pierce, Fla., to be operated by Frontier Refining Co.

● **Shell Oil Co. of Canada, Ltd.,** will add a $3,000,000, 1,500-bbl. per day sulfuric acid alkylation unit at Montreal East, Que., in 1958. **Refinery Engineering, Ltd.,** is contractor.

● **Socony Mobil Oil Co.** will complete in early 1959, a 19,000-bbl.-daily delayed coker at Paulsboro, N. J. **Lummus Co.,** contractor, will start construction of the unit in early 1958.

● **Southland Co.** has bought a site at Black Point, Fla., for a proposed $8,000,000, 15,000-bbl. per day refinery.

● **Sunshine State Refineries, Inc.,** plans a 10,000-bbl. per day plant at Plant City, Fla.

By W. L. Nelson
Technical Editor

Questions on TECHNOLOGY

Wages for Various Craftsmen

In the February 25, 1957 issue on clipped page 148, we see your hourly wages for refinery workers for the year 1946. Is it possible to supply rates for recent years or the present date? We are particularly interested in the rate for welders.—E.R.K.

On the same page are shown wage indexes, and each quarter (January, April, July, and October) the index for construction labor, skilled labor, etc., is published on the Itemized Cost Index page of COST-imating. The wage at various dates is obtained by multiplying the 1946 wage rate by the appropriate index. No index is shown for welders because in most areas welders are paid at the same rate as other workmen in the craft doing the work. Thus, according to page 148, in the February 25, 1957, issue, we might expect that the 1956 wage of welders was around 85 per cent larger (index of 185) than in 1946. The 185 was obtained by averaging the indexes for skilled (ENR), iron workers, pipe fitters, and refinery-construction labor. Table 1 of that issue indicates an average refinery-construction-welder rate of more than $1.72 perhaps $1.77. On such a basis, the rate during 1956 should be about $1.77 times 1.85 or $3.27 per hour.

A precise check is not possible because only a few cities report the wages of welders, but if the rates of the 23 cities listed in the yearly Engineering News Record Construction Cost issue (December 6, 1956, page 125) are averaged, the rate during September 1956 was $3.13 cents per hour. This is too low because it includes the low rates in such cities as San Antonio $2.38, Omaha $2.11, and Charleston $2.85. Thus, the average of $3.27 found above, or even higher, might be more suitable. In Philadelphia, the rate was $3.64 which includes $0.20 fringe benefits.

A more careful study of Engineering News Record data (1949-1956) indicates that the the index and wage rates shown in Table 1 are probably a better average than the approximations offered above.

TABLE 1
Approximate Wage Index for Refinery Construction Welders

	Index	Hourly wage
1946	100	$1.71
1947	111	1.90
1948	122	2.09
1949	129	2.21
1950	139	2.38
1951	150	2.56
1952	164	2.78
1953	176	3.01
1954	183	3.13
1955	191	3.27
1956	193	3.30

Wages have since increased by about 3 per cent so that welders' wages during April 1957 should now be about $3.40 per hour. This applies to builders' trade wage rates and, of course, most welding is done at lower wage rates.

Heating Value of Refinery Gases

The heating value of gas is often used as 1,100 B.t.u. per cu. ft. Isn't this too low for refinery gases, and what is a proper value?—G.W.P.

The 1,100 B.t.u. mentioned applies to natural gas, and it is true that refinery gases have a much higher heating value. It is nearly impossible to state a good average for refinery fuels because they vary so widely in composition. Thus, the gas produced in catalytic reforming may have a heating value of only 535 B.t.u. per cu. ft. whereas the gas produced in catalytic cracking may have a heating value as high as 1,700 B.t.u.

The analyses of refinery gases found in the literature are confusing because they usually contain relatively large amounts of high-heating-value gases that are removed as polymer gasoline or alkylate before the gas is burned. It was therefore decided to compute the heating value of the entire range of gases as shown in Table 1. The final fuel gas was considered to be substantially free of four-carbon-atom gases, and to contain only one-third of the original propane and propylene. It was also assumed that the gases contained 1.5 per cent of inert gases (mainly nitrogen and carbon dioxide). Such computations (see Table 1) indicate that refinery - fuel - gas mixtures usually range in heating value from 1,100 to 1,400 B.t.u. per cu. ft. with the average gas probably exceeding 1,300 B.t.u.

On a pound basis, all of the gases except that rich in hydrogen, have about the same heating value (i.e., 21,800 to 23,400).

TABLE 1—HEATING VALUES OF REFINERY GASEOUS FUELS*

	H_2	CH_4	C_2H_4 and C_2H_6	C_3H_6 and C_3H_8	iC_4H_8 plus	B.t.u. per cu. ft.† Gross	B.t.u. per cu. ft.† Net	M.W.†	B.t.u. per lb., Gross
Natural gas	..	92	6	1	1	1,080	975	17.7	23,400
Natural gas	..	90	6	2	2	1,115	1,010	18.5	23,100
Natural gas	..	83	7	8	2	1,210	1,105	20.2	22,800
Natural gas	..	71	14	11	4	1,350	1,240	22.8	22,500
Catalytic cracked gas‡	12	19	24	45	(‡)	1,700	1,590	29.6	21,800
Catalytic reforming‡	85	5	4	6	(‡)	535	475	6.5	32,600
Refinery mixtures‡	7	38	29	26	(‡)	1,505	1,390	25.8	22,100
Refinery mixtures‡	18	36	18	28	(‡)	1,385	1,280	23.4	22,500
Refinery mixtures‡	24	48	12	16	(‡)	1,135	1,040	18.7	23,200
Refinery mixtures‡	39	21	23	17	(‡)	1,120	1,030	18.3	23,400

*Gross heating value = approximately 380 ÷ 46 M.W. †Reduced by 1.5 per cent for inert gas. ‡After removal of four-carbon-atom gases and one-third of the propane and propylene.

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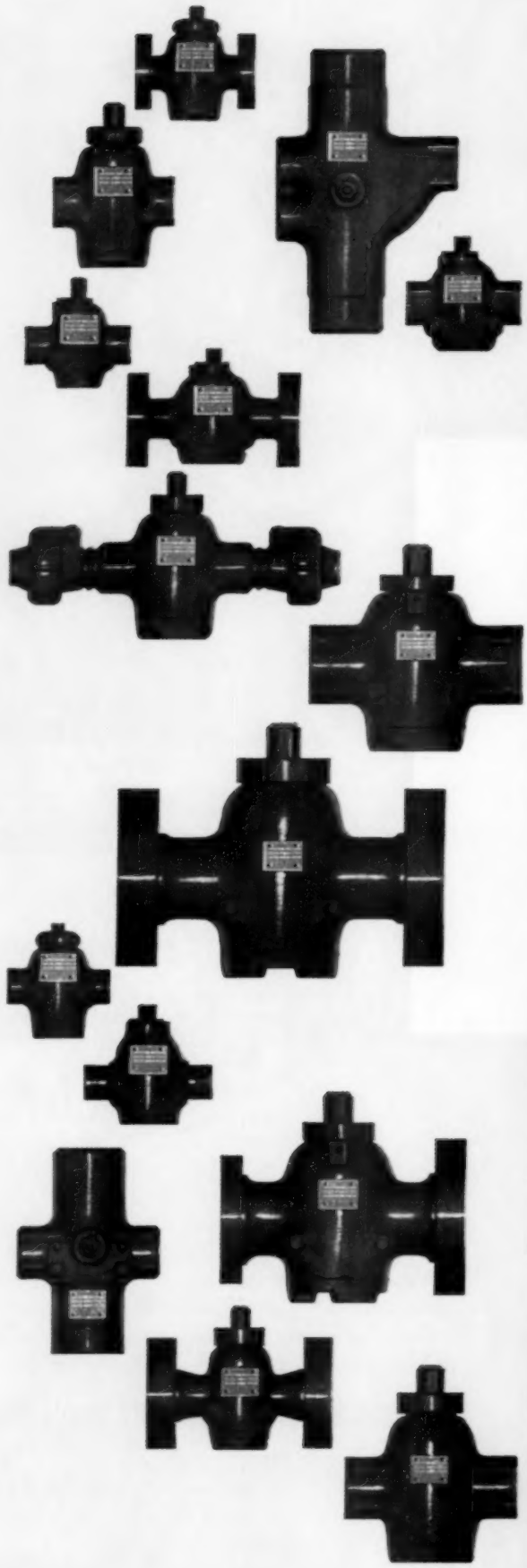

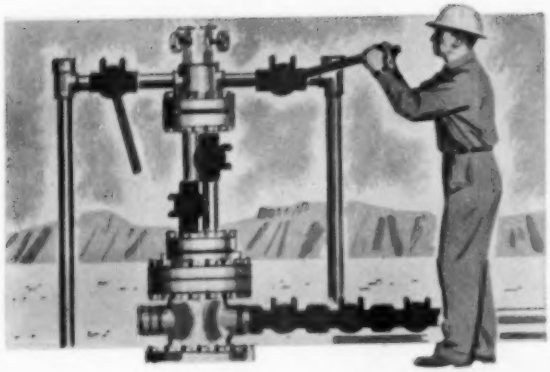

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YOU CAN DEPEND ON DOW

Who's Laying Line—and Where

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way.

U.S. Crude-Oil Pipelines

- **Belle Fourche Pipeline Co.**
  Project: 30 miles of 6-in. from Donkey Creek pool to Fiddler Creek pool in northeastern Wyo. Will later build a line from Fiddler Creek to connect with Butte Pipe Line Co. near Osage, Wyo.
  Status: Planned.
- **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.)
  Project: Line from lower Delaware Bay to Philadelphia.
  Status: Planned.
  Completion: 1960.
- **Derby Refining Co.**
  Project: 200 miles of 12-in. from Meade County, Kans., to Wichita.
  Status: Under study.
- **Forest Oil Corp.**
  Project: 35 miles of 8-in. from Grieve Unit field, Wyoming, to the Platte Pipe Line near Casper.
  Status: Under way.
  Completion: Mid-January 1958.
- **Four Corners Pipe Line Co.** (Shell, Standard of Calif., Continental, Gulf, Richfield, Superior)
  Project: 635 miles of 16-in. from Aneth field in southern Utah to Los Angeles, 86 miles of 12-in. from New Mexico's Bisti field to Red Mesa station 35 miles southeast of Bluff, Utah, and 28 miles of 4, 6, 8-in. feeder lines from other fields in New Mexico and Utah. Will be operated by Shell Pipe Line.
  Status: Under way.
  Contractor: **A. P. Vaughn Construction Co.** has 170 miles of 16-in. from Aneth field to Cameron, Ariz., and 100 miles of 16-in. from Seligman to the Colorado River. **R. H. Fulton & Co** has completed 98 miles of 16-in from Cameron to Seligman, Ariz., and has 217 miles of 16-in from the Colorado River to O'ive, Calif., plus river crossing. **Pacific Pipeline Construction Co.** has 46 miles of 16-in. from Olive to Los Angeles. **Standard Pipeline Construction Co.** has feeder lines.
  Completion: February 1, 1958.
- **Gillette Pipeline, Inc.** and **A. W. Hartwig, Inc.**
  Project: A 102-mile line from Dead Horse Creek field to Casper. Wyo.
  Status: Has applied for permit from Wyoming Pub'ic Service Commission.
- **Great Northern Railway Co.**
  Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Montana and North Dakota, to Clearbrook or St. Paul, Minn.
  Status: Planned.
  Contractor: **Pipe Line Technologists, Inc.** has completed feasibility study.
- **Humble Oil & Refining Co.**
  Project: 90 miles of 16-in. from Hawley to Comyn, Tex.
  Status: Survey and right-of-way work under way.
  Completion: Late 1958.
- **Jayhawk Pipeline Corp.** (Colorado Oil & Gas Corp., National Cooperative Refinery Association)
  Project: 242 miles of 10 and 12-in. from western Meade County, Kansas, to Valley Center near Wichita.
  Status: If approved by Kansas Corp., Com., work will start spring 1958.
  Contractor: **Pipe Line Technologists,** Houston, has engineering contract.
- **Magnolia Pipe Line Co.**
  Project: 120 miles of 16-in. from Clyde to Iatan, Tex.
  Status: Under way.
  Contractor: **O. R. Burden Construction Corp.**
  Completion: December 31, 1957.
- **Offshore Gathering Corp.,** Houston.
  Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)
  Status: Proposed.
- **Oil Field Pipe Line, Inc.**
  Project: 20 miles 8 and 12-in. line from near Elkhart, to Ellinwood, Kans.
  Status: Proposed.
- **Shell Oil Co.**
  Project: 17 miles of 3, 4-in. in La. Delta area.
  Status: Under way.
  Contractor: **Brown & Root, Inc.,** W. P. Stanley, supt., office at Buras.
  Completion: March 31, 1958.
- **Shell Pipe Line Corp.**
  Project: 11 miles of 8-in., 3 miles of 10-in., 10 miles of 12-in., 37 miles of 16-in., and 60 miles of 20-in. from Mississippi River Delta area to New Orleans refining area.
  Status: Planned.
  Contractor: **Coates Field Service, Inc.,** has right-of-way acquisition and claims settlement.
  Completion: September 1958.
- **Sinclair Pipeline Co.**
  Project: 150 miles of 20-in. from Teague, Tex., to Houston.
  Status: Under way.
  Completion: Early 1958.
- **Skelly Oil Co.**
  Project: 50 miles of 12-in. to replace partially looped 6, 8-in. line between Cunningham and Burton, Kans.
  Status: Under way.
  Contractor: **Groninger & King.**
  Completion: December 1957.
- **Southern Kansas Pipeline, Inc.**
  Project: 200 miles of 6 to 10-in. in Kans. from southwestern Meade County to 10 miles north of Arkansas City.
  Status: Proposed. Request filed with Kansas Corporation Commission for permit.
- **Texas-New Mexico Pipe Line Co.** (Sinclair, Texas Co., Tidewater, Empire)
  Project: 512 miles of 16-in. from southeast corner of Utah to Jal, N. M.
  Status: Under way.
  Contractor: **Four Way Co., Inc.,** has 150 miles from Aneth field southeast. **Panama, Inc.,** has remaining 362 miles.
  Comp'etion: May 1958.
- **Toronto Pipeline Co.**
  Project: System to connect fields in Cheyenne, Morrill, and Banner counties, Nebr., to Platte Pipe Line Co.'s 20-in. line from Wyoming to Wood River, Ill., and 13 miles of 4-in. plus field lines to Platt's Redding station.
  Status: Planned.

U.S. Products Pipelines

- **Alaska-Yukon Refiners & Distributors, Ltd.**
  Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canol line; another from Tok Junction, on Canol line, to Anchorage.
  Status: Proposed.
  Completion: 1959.
- **American Pipe Line Co.**
  Project: Line from Gulf Coast to New York City. Has ODM approval to amortize 40 per cent of cost with fast writeoff.
  Status: Proposed.
- **Buckeye Pipe Line Co.**
  Project: 70 miles of 8-in. from Wayne to vicinity of Durand, Mich.
  Status: Under way.
  Completion: Early 1958.
- **Clark Oil & Refining Co.**
  Project: 15 miles of 8-in. from Blue Island, Ill., to Hammond, Ind., area.
  Status: Planned.
  Completion: Mid-1958.
- **Columbia Gas System, Inc.**
  Project: Line from proposed plant near Kenova, W. Va., to proposed plant and storage facilities at Siloam, Ky.
  Status: Planned.
- **Conn-Mass Pipe Line, Inc.**
  Project: 62 miles of 8-in. and 7 mi'es of 6-in. from New Haven, Conn., to Springfield, Mass.
  Status: Planned to begin in 1957.
  Completion: April 1958.
  Project: 88 miles of 8-in. from Boston to Springfield, Mass.
  Status: Proposed.
  Project: 133 miles of 16-in. from Linden, N. J., to Hartford, Conn.
  Status: Proposed.
  Project: 38 miles of 6-in. from Waltham to Fitchburg, Mass.
  Status: Proposed.
- **El Paso Natural Gas Co.**
  Project: 240 miles of 6-in. from Odessa to El, Paso, Tex.
  Status: Under way.
  Contractor: **McVean & Barlow, Inc.,** E. J. Miller, supt.
  Completion: March 1, 1958.
- **Everglades Pipe Line Co.**
  Project: 60 miles of 10-in. from Port Everglades, Fla., to Miami's International Airport and terminals south.
  Status: Under way.
- **Georgia Pipeline Co.**
  Project: 7-mile line from Savannah, Ga., to Hunter Air Force Base
  Status: P'anned.
  Completion: December 31, 1957.
- **Katy and New York Central Railroads**
  Project: 2,000 miles of 10 or 12-in. from Houston through Kansas City, St. Louis, Indianapolis and Cleveland to Syracuse then down to New York City. A branch would go through Chicago to Detroit.
  Status: Planned.
  Contractor: **Williams Brothers Co.** has feasibility study. Report due December 1957.
- **Laurel Pipe Line Co.** (Gulf Refining Co., Sinclair Pipe Line Co., The Texas Co.)
  Project: 100 miles of 24-in. and 340 miles of line graduating down to 14-in. at

the west terminus, from Philadelphia to Cleveland.
Status: To start early 1958.
Contractor: **Pipe Line Maintenance & Construction Co.**, Camp Hill, Pa., has Susquehanna River crossing.
Completion: Summer 1958.

- **Leonard Refineries, Inc.**
Project: 43 miles of 6-in. from Alma to Lansing, Mich.
Status: Planned.
Contractor: **Welded Construction Co.**
Completion: Spring 1958.
- **Ohio Oil Co.**
Project: 350 miles of 12-in. from Wood River, and Robinson, Ill., to Chicago.
Status: Under way.
Contractor: **Panama-Williams Corp.** has completed 84 miles from Robinson to Champaign.
Completion: 1958.
- **Salt Lake Pipe Line Co.**
Project: 80 miles of 8-in. loops from Adams to Ontario, Ore.
Status: Under way.
Contractor: **Hallmac Construction Co.**
- **Shamrock Oil & Gas Corp.**
Project: Conversion of 120 miles of 6-in. crude line from Sunray, Tex., to Turpin, Okla.
Status: Under way.
- **Southern Pacific Pipe Lines, Inc.**
Project: 30 miles of 6-in. and 6 miles of 4-in. from Niland to El Centro, Calif.
Status: Under way.
Contractor: **Hood Construction Co.**
Completion: January 1958.
- **Underground Storage & Exploration, Inc.**
Project: 393 miles of 12-in. L.P.G. line from Moundsville, W. Va., to Newark, N. J., plus 95 miles of 6, 8-in. laterals to Mauch Chunk, Pa., and to Philadelphia.
Status: Proposed.
- **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area.
Status: Proposed.

U.S. Natural-Gas Pipelines

- **American Louisiana Pipe Line Co.**
Project: 7 miles of 16-in. and 5 miles of 12-in. from Second Bayou to Cameron, La.
Status: Under way.
Contractor: **Ford, Bacon & Davis Construction Corp.**
Completion: December 1958.
- **Arkansas Louisiana Gas Co.**
Project: A 300-mile line, plus gathering lines, from Tex.-La. coastal area to northern La., to connect with present system.
Status: Long-range plans.
- **Carnegie Natural Gas Co.**
Project: Two parallel lines to provide coke-oven gas to six Pittsburgh area plants: 9 miles of 55-in. and 4 miles of 43-in. each.
Status: Under way.
Contractor: **Williams Brothers Co.**
Completion: January 1, 1959.
- **Chicago District Pipeline Co.**
Project: 52 miles of 30, 36-in. between Joliet and Chicago, Ill.
Status: Approved by FPC examiners.
Completion: 1958.
- **Cities Service Gas Co.**
Project: 75 miles of 30-in. from Independence to near Welda, Kan.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Completion: December 31, 1957.
- **Coastal States Gas Producing Co.**
Project: A 20-mile gathering system from the Rock Island area of Colorado County, Tex., to the United Gas Corp. system.
- **Coastal States Gas Producing Co.** and **Southern Coast Corp.**
Project: 45 miles of 2 to 10-in. in Bee County, Tex. to connect presently shutin fields with Texas Eastern Transmission Corp.'s system.
Status: Planned.
- **Coastal Transmission Corp.**
Project: 562 miles of 12, 20, 22, 24-in. main line and 336 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: Survey and right-of-way work under way. Pipe laying to start January or February 1958.
Completion: January 1, 1959.
- **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.
- **Colorado Interstate Gas Co.**
Project: 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pubelo, Colo.; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 24 miles of 22-in. Tex. Panhandle looping.
Status: Approved by FPC examiners.
- **Consolidated Gas Utilities Corp.**
Project: 21 miles of 12-in. and 10 miles of 8-in. at Altus, Okla.
Status: Approved.
- **Eastern Shore Natural Gas Co.**
Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp., in Maryland, across entire length of Delaware to Salisbury.
Status: Pending FPC approval.
- **El Paso Natural Gas Co.**
Project: 95 miles of 34-in. San Juan main line loops.
Status: Under way. Partially certificated.
Contractor: **R. H. Fulton & Co.** has 28 miles. **Western Pipeline, Inc.**, has 47 miles. Remainder to be let.
Completion: April 1, 1958.
Project: 18 miles of 12-in. between Good Field in Borden Co., and the East Vealmoor gasoline plant in Howard Co., Tex.
Status: Has temporary FPC approval.
Project: 177 miles of 20-in. from Sonora plant, Sutton County, to Plains plant, Yoakum County, Texas.
Status: Planned. Filed for FPC permit.
Completion: July 1, 1958.
Project: 193 miles of 30-in. Permian-San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: September 1, 1958.
Project: 216 miles of 6 to 34-in. and 533 miles of various size in Ariz., Tex., N. M.
Status: Filed for FPC permit.
Project: 38 miles of various size line to make additional gas available at the McElroy-Wilshire plant near Crane, Tex.
Project: 500 miles of 34-in. from Twin Falls, Idaho to California border near Las Vegas, Nev.
Status: Planned.
Completion: September 1, 1959.
- **Equitable Gas Co.**
Project: 12 miles of storage line in Lewis Co., W. Va.
Status: Approved.
- **Gulf Interstate Gas Co.**
Project: 10 miles of 12-in. supply loop to Erath field, Vermilion Parish, Louisiana, and 9 miles of various size field lines in Acadia and Vermilion parishes, Louisiana.
Status: Approved.
Project: 10 miles of 20-in. loop in Jefferson Davis and Vermilion parishes, Louisiana, and 3 miles of 6-in. loop in Cameron Parish, Louisiana.
Status: Has temporary FPC approval.
Project: 352 miles of 30-in. loop between Louisiana and Leach, Ky.; 54 miles of 24-in. lateral in Louisiana.
Status: Filed with FPC.
Completion: 1959.
- **Houston Texas Gas & Oil Corp.**
Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 139 miles of 18-in. and 101 miles of 20-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sales laterals in Florida. Main line to join Coastal Transmission's line from McAllen, Tex., to Baton Rouge.
Status: Under way.
Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.
Completion: June 1958.
- **Humble Oil & Refining Co.**
Project: 250 miles of 26 or 30-in. from Southwest Texas area to Houston, plus 200 miles of various size gathering lines.
Status: Under way.
- **Iron Ranges Natural Gas Co.**
Project: 120 miles of 6, 12-in. from Mesabi Iron Range to northern Minn.
Status: Pending FPC approval.
Completion: November 1, 1958.
Project: 63 miles of 12-in. on north shore of Lake Superior.
Status: Pending FPC approval.
Completion: November 1, 1958.
- **Kerr-McGee Oil Industries, Inc.**
Project: 24 miles of 4-in. in Blocks 21, 22, and 32 to connect wells with its Breton Sound production island off the Louisiana coast.
- **Manufacturers Light & Heat Co.**
Project: 3 miles of 12-in. from Wellsville to a point in Saline Township, Ohio; 8 miles of 12-in. in Brook County, W. Va.; 4 miles of 10-in. in Ohio County, W. Va.
Status: Approved.
- **Michigan Consolidated Gas Co.**
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.**; Floyd Huduall, supt., office at Cadillac.
Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.**, jointly with **H. L. Gentry Construction**, Frank Morris, superintendent, office at Hart, Mich.
- **Michigan Gas Storage Co.**
Project: 40 miles of 12-in. and 12 miles of gathering lines from Overisal field in Allegan County to Kalamazoo, Mich.
Status: Planned.
Contractor: **Bechtel Corp.**
- **Michigan Wisconsin Pipe Line Co.**
Project: 33 miles of 4, 6-in., 2 miles of 12-in., 4 miles of 10-in., and 7 miles of 8-in. gathering lines in LaVerne Field, Harper County, Okla.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.
Project: 56 miles of 20-in. extension of LaVerne line, Harper County, Okla.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.
Project: 25 miles of 12-in. and 21 miles of 24-in. loops in Wis. and Mich.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.
- **Midwestern Gas Transmission Co.**
Project: Line from Portland, Tenn., to Minnesota-Canada border near Emerson, Man.: 670 miles of 24-in., 218 miles of 20-in, 371 miles of 16-in., 115 miles of 12-in., 70 miles of 10-in., 179 miles of 8-in., 147 miles of 6-in., 174 miles of 4-in., 106 miles of 3-in.
Status: Pending FPC approval.

PIPELINE CONSTRUCTION

• **Mookl Chemical & Gas Corp.** and **Missouri Transmission Corp.**

Project: 425 miles of 16-in. from Pottawatomie County, Okla., to St. Louis. Mookl, 1341 S. Boston, Tulsa, will build Okla. section. Missouri Transmission, Springfield, Mo., will build the Mo. section.

Status: Tentative plans before FPC.

Contractor: **Fish Engineering Corp.** and **DeGolyer & MacNaughton** are preparing engineering and reserves reports.

• **Natural Gas Pipeline Co. of America**

Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., plus a gathering system.

Status: Under way.

Contractor: **R. H. Fulton & Co.** has Red River crossing in northern Montague County. **Fulton & Brodie, Inc.,** has gathering system. **Eastern Pipeline Contractors** has completed 86 miles of 20-in. from Bridgeport, Tex., to Healdton, Okla. **River Construction Corp.** has completed 86 miles of 26-in. from Mountain View, Okla., to Wheeler, Tex., and 87 miles of 26-in. from Wheeler to Fritch, Tex. **H. B. Zachry Co.** has completed 88 miles of 26-in. between Ringling and Mountain View, Okla.

Completion: January 1, 1958.

Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and 91 miles of 30-in. loops along parts of its main line.

Status: Approved by FPC examiner.

Project: 337 miles of 30-in. between Fritch, Tex., and Beatrice, Neb., and 59 miles of 36-in. between Beatrice and Joilet, Ill., along existing system.

Status: Pending FPC approval.

Completion: 1959.

• **Niagara Mohawk Power Corp.**

Project: 196 miles of 2 to 16-in. transmission and distribution mains to service areas in central, eastern and northern New York.

Status: Under way.

Contractor: Various.

Completion: December 31, 1957.

• **North Carolina Natural Gas Corp.**

Project: 630 miles of 2 to 16-in. from near Mooresville, eastwardly across N. C.

Status: Under way.

Completion: Spring 1958.

• **Northern Natural Gas Co.**

Project: 23 miles of 24-in. loops in Nebr. and Iowa; 43 miles of 30-in. loops in Kans., Nebr., and Iowa; 169 miles of 20-in. from Farmington, Minn., to Superior, Wis.; 44 miles of 16-in. in Duluth-Superior-Iron Ranges area.

Status: Pending FPC approval.

Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

Status: Proposed.

Project: 1,090 miles of 2 to 16-in. branch lines to serve communities in Minn., Iowa, S. D., Nebr., Wis.

Status: Filed with FPC March 18, 1957.

Project: 28 miles of 30-in. loop in Tex. and Kans.

Status: Pending FPC approval.

• **Northern Utilities Co.**

Project: 35 miles of 16-in. in Fremont-Natrona County, Wyoming, area; 8 miles of 12-in. around Casper; 6 miles of 8-in. from Sand Draw gas field to Beaver Creek field; 12 miles of 6-in. from Beaver Creek field to the system servicing the Riverton-Lander area.

Status: P'anned.

• **Offshore Gathering Corp.**

Project: 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)

Status: Application pending with FPC.

• **Olin Gas Transmission Corp.**

Project: Mississippi River 3 and 8-in. crossing near White Castle, La.

Status: Under way.

Contractor: **Houston Contracting Co.,** A. J. Slovack and R. E. Thornton, supts., office at White Castle.

• **Pacific Gas & Electric Co.**

Project: 138 miles of 34-in. looping of the Topock-Milpitas line.

Status: Under way.

Contractor: **Engineers Limited Pipeline Co.**

Completion: February 1958.

Project: 5 miles of 16-in., 160 miles of 12-in., 8 miles of 8-in. from Corning to Eureka, Calif.

Status: Under way.

Contractor: **Engineers Limited Pipeline Co.** and **Alex Robertson Co.**

Completion: June 1958.

Project: 13 miles of 12-in. and 2 miles of 10-in. from Santa Cruz to Davenport, Calif.

Status: Under way.

Contractor: Company personnel will build part; remainder to be let.

Completion: January 1958.

• **Pacific Lighting Gas Supply Co.**

Project: 83 miles of 34-in. from North Coles Levee to Newhall, Calif.

Status: To start early 1958.

Contractor: **Engineers Limited Pipeline Co.**

Completion: July 1, 1958.

• **Pacific Northwest Pipeline Corp.**

Project: 40-mile line from Ute Trail gas fields in northeastern Utah to its main line in western Colorado.

Status: Planned to start spring 1958.

• **Pennsylvania Gas Co.**

Project: 23 miles of 10-in. in Erie County, Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa., 30 miles of branch lines, several small distribution lines.

Status: Has FPC permit.

• **Permian Basin Pipeline Co.**

Project: 29 miles of 10-in. gathering lines from Crane and Pecos counties to McCamey, Tex.

Status: Under way.

Contractor: **Lone Star Constructors, Inc.**

• **Phillips Petroleum Co.**

Project: 30 miles of 3 to 8-in. in Moore, Hutchinson, Sherman, Hansford, and Gray counties, Tex., and in Texas County, Okla.

Status: Planned.

Contractor: Various.

Completion: January 1, 1958.

• **Piedmont Gas Co.**

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Status: Has FPC approval.

• **Southern Natural Gas Co.**

Project: 335 miles of 4 to 26-in. in southern La.

Status: Pending FPC approval.

Completion: December 1, 1958.

Project: 45 miles of 6 to 10-in. in southern La.

Status: Pending FPC approval.

Completion: December 1, 1958.

Project: 25 miles of 6 to 20-in. in southern La.

Status: Pending FPC approval.

Completion: December 1, 1958.

• **Tennessee Gas Transmission Co.**

Project: 556 miles of 30-in. from Mississippi Delta area south of New Orleans to Portland, Tenn.

Status: Has temporary FPC approval.

Project: 76 miles of 24-in. from Coudersport, Pa., to Hamburg, N. Y.

Status: Has temporary FPC approval.

Project: 163 miles of 30-in. and 101 miles of 26-in. from Portland, Tenn., to near Lancaster, Ky.; from Winchester, Ky., to Morehead, Ky.; from Catlettsburg, Ky., toward Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from Morehead, Ky., to Catlettsburg, Ky.

Status: Has Temporary FPC approval.

• **Texas Eastern Transmission Corp.**

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.

Status: Has FPC approval.

Project: 140 miles of 30-in. between Kosciusko, Miss., and Uniontown, Pa., 105 miles of 30-in. between Opelousas, La., and Kosciusko, 22 miles of 14-in. supply line in La.

Status: Pending FPC approval.

• **Transcontinental Gas Pipe Line Corp.**

Project: 202 miles of 36-in. and 132 miles of 30-in. main line loop; 164 miles of 24-in. to connect storage in Pa.; 202 miles of 10 to 20-in. gathering lines in southeast La.; 48 miles of 10 to 20-in. to tap gas off Tex.

Status: Pending FPC approval. Planned to start February 1, 1958.

Project: 57 miles of 36-in. main line loop.

Status: Pending FPC approval. Planned for 1959.

Project: 57 miles of 30, 36-in. loops in La., Miss., Ala., Ga., S. C., and 247 miles of mostly 24 and 16-in. laterals in Tex., and La.

Status: Under way.

Contractor: **H. B. Zachry Co.** and **Panama-Williams Corp.** have gathering lines.

Completion: January 1958.

Project: 87 miles of 24-in. laterals, plus small gathering lines connecting seven Louisiana fields with the New Orleans area.

Status: Pending FPC approval.

• **Trans-Western Pipe Line Co.** (Warren Petroleum, Monterey Oil Co.; J. R. Butler).

Project: A line from Four Corners area to Calif. border.

Status: Proposed.

• **United Gas Pipe Line Co.**

Project: 18 miles of 12-in. from Lirette-Mobile line in Jackson County, south to Bayou Casottee industrial area east of Pascagoula, Miss.

Status: Approved.

Project: 202 miles of 30-in. loop from southeast Louisiana, to Mobile, Ala.

Status: Pending FPC approval.

Canadian Crude-Oil Pipelines

• **Act Oils, Ltd.**

Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Bella Coola, B. C.

Status: Request has been made for permit from the B. C. government.

• **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

• **East Coast Transmission Co.** (Pacific Petroleums, Ltd., Home Oil, Ltd., Canadian Homestead Oil, Ltd., Merrill Petroleums, Ltd.

Project: Line from Alberta to Montreal.

Status: Proposed.

• **Gibson Petroleum Co., Ltd.**

Project: 25 miles of line from Willesden Green field to near Rimbley, Alta.

Status: Has Alberta Government approval.

• **Royalite Oil Co., Ltd.**

Project: 250-mile line from Athabasca oil sands, northeastern Alta., to Edmonton.

Status: Long-range plans.

Completion: 1960.

• **Westspur Pipe Line Co.**

Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-

PIPELINE CONSTRUCTION

Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.

Status: Has requested permit from Board of Transport Commissioners.

Contractor: **Majestic Contractors, Ltd.,** Jeff Minter, supt., office in Estevan, Sask.
Completion: No date set.

Canadian Products Pipelines

- **Hydrocarbons Pipeline Co.**

Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.

Status: Has permit from Parliament of Canada. Seeking approval by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.

Construction consultants: **Dutton-Williams Brothers, Ltd.,** and **A. D. Little Co.**

Canadian Natural-Gas Pipelines

- **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.
Status: Under way.
Contractor: **Dutton - Williams Brothers, Ltd.,** has preliminary studies, design and management - engineering. **Universal Pipe Line, Ltd.,** subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.,** has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress. **Fulton Banister, Ltd.,** has completed 17 miles of 34-in. west from Burstall, Sask., to near Cavendish, Alta., and 100 miles of 18-in. north to Bindless and Provost fields.

- **Alberta & Southern Transmission Co., Ltd.**

Project: 1,300 miles of 36-in. from Alberta to San Francisco area plus 47 miles of gathering lines.
Status: Planned.
Completion: 1960.

- **Northern Ontario Pipe Line Crown Corp.**

Project: 675 miles of 30-in. from the Ontario-Manitoba border to near Kapuskasing, Ont. (part of the 2,250-mile Trans-Canada line; will be leased to Trans-Canada Pipe Line Co. with option to buy.) 360 miles from Port Arthur to Kapuskasing remains to be laid in 1958.
Status: Under way.
Contractor: **Nelen, Ltd.; Majestic Contractors, Ltd.; River Construction Corp.; Mannix, Ltd.; and Morrison Shivers, Ltd.**
Completion: November 1958.

- **Northwestern Utilities, Ltd.**

Project: 72 miles of 16-in. from Pembina field to Edmonton, Alta.
Status: Approved. Planned for 1958.
Completion: 1958.

- **Trans-Canada Pipe Lines, Ltd.**

Project: 491 miles of 30-in. from Kapuskasing to Toronto.
Completion: October 1, 1958.

- **Westcoast Transmission Co., Ltd.**

Project: 42 miles of 20-in. and 100 miles of 30 in. from Savanna Creek area, Alta., to Canadian-Idaho border.
Status: Planned.
Completion: November 1, 1958.
Project: Looping of present system to double capacity.
Status: Planned.

Foreign Crude-Oil Pipelines

- **Arabian American Oil Co.**

Project: 9 miles of 32-in. loop from Abqaiq toward Shedgum.
Status: Planned.
Completion: 1960.
Project: 17 miles of 32-in. extension of loop from Abqaiq toward Shedgum.
Status: Planned.
Completion: 1961.
Project: 9 miles of 30-in. extension of loop from Abqaiq toward Shedgum.
Status: Planned.
Completion: 1960.
Project: 12 miles of 30-in. extension of loop from Abqaiq toward Shedgum.
Status: Planned.
Completion: 1961.
Project: 54 miles of 30-in. loop of Safaniya-Ras Tanura line.
Status: Planned.
Completion: January 1959.
Project: 63 miles of 30 and 32-in. from Khursaniyah to Ras Tanura.

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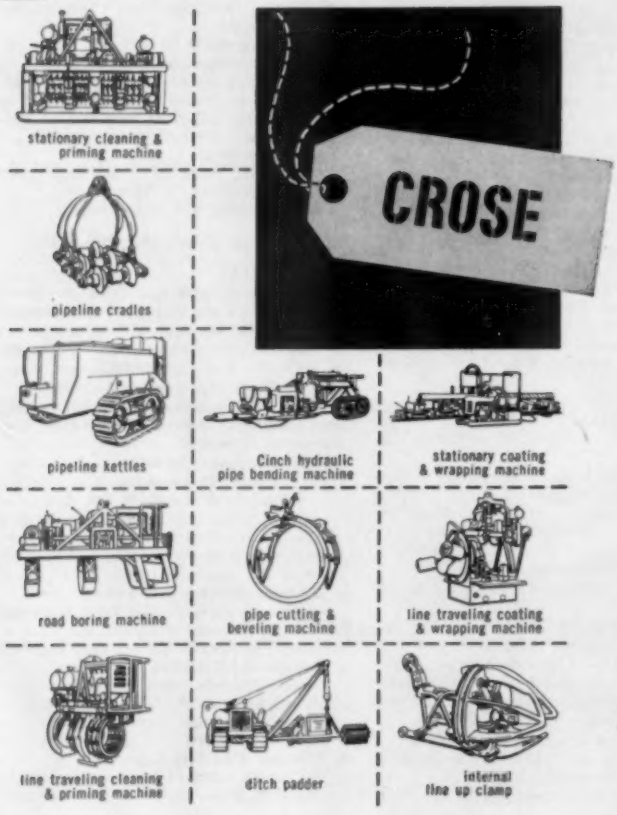

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PIPELINE CONSTRUCTION

Status: Planned.
Completion: January 1960.

- **Assam Oil Co.**
  Project: 600 miles of 20-in. from Nahorkatiya field in Upper Assam to Barauni, India, to connect with Burmah Oil Co.'s proposed 250-mile line from Barauni to Calcutta.
  Status: Survey of possible routes under way.
  Contractor: **Pipe Line Engineering Co.** is making survey.
- **Bolivia-Paraguay.**
  Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.
  Status: Planned .
  Contractor: **Five Lilles,** a French Combine.
- **Burmah Oil Co., Ltd.**
  Project: 250 miles of 20-in. from Barauni to Calcutta, India, extending Assam Oil Co.'s proposed line.
  Status: Survey under way.
  Contractor: **Collins Construction Co.** is surveying locations for some 40 river crossings.
- **Caltex**
  Project: 30 miles of 30-in. from Duri field in Sumatra to Dumai where a deepwater terminal will be built. Line will be extended 35 miles to Minas field later.
  Status: Under way.
  Contractor: **Bechtel Corp.**
  Completion: May 1958.
- **Cia. Shell de Venezuela**
  Project: 34 miles of 16-in. from Boscan to site of a planned terminal at Puerto Miranda, Venezuela.
  Status: Proposed.
- **Colombian Petroleum Co.**
  Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.
  Status: Under way.
- **C.R.E.P.S., Societe Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal), and Cie. Francaise des Petroles Algerie**
  Project: 105 miles of 6-in. from Hassi Messaoud and Edjele, Algeria, to the railhead at Touggourt.
  Status: Planned.
  Completion: 1958.
  Project: 450 miles of 16-in. from Edjele field in southeastern Algeria to a Mediterranean port on the Libyan coast.
  Status: Pipe has been ordered.
- **Creole Petroleum Corp.**
  Project: 100 miles of 30-in. from Temblador field to Caripito in Venezuela.
  Status: To start work early in 1958.
  Contractor: **Pipe Line Engineering Co.** and **Oklahoma Pipe Line Constructors,** R. J. O'Connell, supt., office at Maturin.
  Completion: April 30, 1958.
- **Elburz Oil Corp.**
  Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.
  Status: Planned.
- **Iranian Consortium.**
  Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bandar Mashur line.
  Status: Planned.
  Project: 50 miles of 26, 28-in. from Gach Saran field to new terminal on Persian Gulf.
  Status: Planned.
- **Iraq Petroleum Co.**
  Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq to Turkish port of Iskenderun on the Mediterranean.
  Status: Proposed. Survey completed.
- **Mene Grande Oil Co.**
  Project: 97 miles of 30-in. from fields in

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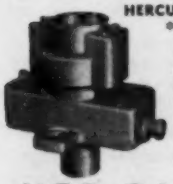

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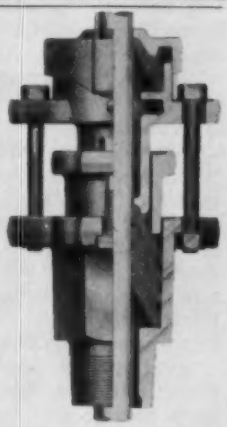

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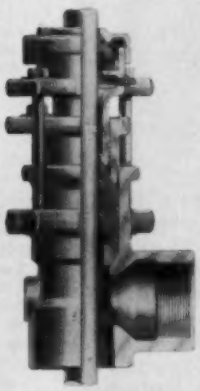

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PIPELINE CONSTRUCTION

Eastern Venezuela to Puerto La Cruz.
Status: Under way.
Contractor: **Fulghum Contracting Corp.** has 22 miles between Oficina and Anaco. **Williams Brothers Co.** has remainder.
Completion: First quarter 1958.
Project: 45 miles of 24-in. from Oficina to Melones, Venezuela.
Status: Planned.
Completion: First quarter 1958.

- **Middle East Pipeline**

Project: 1,500 miles of 38 and 40-in. line from Persian Gulf to Mediterranean at Iskenderun, Turkey.
Status: Proposed.

- **North-West Oil Pipeline Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)

Project: 230 miles of 28-in. from refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.
Status: Work to start early 1958.
Contractor: **W. M. Lyles** in joint venture with two German steel firms.
Completion: November 1958.

- **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, Netherlands, and Belgium. Main trunk to be 30-in.
Status: Company is considering project together with several other companies.

- **Standard-Vacuum Petroleum Maatschappij**

Project: 94 miles of 8-in. from Lirik field, Central Sumatra, to deep-water terminal on Siak River, near Buatan. A 3-in. hot-water "defroster" line will be laid under the 8-in. to heat the heavy crude.
Status: Under way.
Completion: Late 1957.

- **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**

Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.
Status: Under study.

- **Union of Soviet Socialist Republic**

Project: 2,300-mile Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.

- **Yacimientos Petroliferos Fiscales** (Argentina)

Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Planned.
Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.)
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: To start 1st quarter 1958.
Completion: Mid-1960.

- **Yacimientos Petroliferos Fiscales Bolivianos**

Project: 174 miles of 10-in. and 44 miles of 8-in. from Sicasica, Bolivia, to Arica, Chile.
Status: Planned.
Contractor: **Williams Brothers Co.** and **Telescopic Pipe Line.**
Completion: October 1958.

Foreign Products Pipelines

- **Empresa Nacional de Petroles** Government of Chile and Cia de Petroles de-Chile (Copec), et al.

Project: 75 miles of 10-in. from Chile's coastal refinery at Concon to Santiago.
Status: Under way.
Contractor: **Williams Brothers.**
Completion: Early 1958.

- **National Iranian Oil Co.**

Project: 90 miles of 12-in. from Abadan to Ahwaz, Iran.
Status: To start spring 1958.
Contractor: **Entrepose Co.,** Paris.
Completion: Summer 1958.

- **North Atlantic Treaty Organization**

Project: 2,000 miles of lines to airfields in parts of Europe.
Status: Under way.
Contractor: **Associated Pipeline Contractors, Inc.** (450 miles from Iskenderun, Turkey, to Batman); **TECHINT** (205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir).

Foreign Natural-Gas Pipelines

- **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.
Status: Planned.

- **City of Riyadh, Saudi Arabia**

Project: 182 miles of 10-in. from Ghawar field to Riyadh.
Status: Planned.

- **Cuban Gas Transmission Co.**

Project: 650-mile pipeline from Campeche area of Mexico across Yucatan and on the ocean floor to Havana, Cuba; 150 miles would be submarine.
Status: Being studied by Ebasco Services.

- **Gaz de France**

Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. terminal to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.
Status: Under way.
Contractor: French contractors.
Completion: First stage in 1958; complete system in 1960.

- **NIOGAS**

Project: 160 miles of 6, 8, 10, and 12-in. from Fischamend field to Vienna and other Austrian cities.
Status: Under way.
Contractor: **Williams Brothers Co.** and **Costain-John Brown, Ltd.**
Completion: Fall 1958.

- **Petroleos Mexicanos.**

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.

- **Sui Gas Transmission Co.**

Project: 217 miles of 16-in. from Sui gas field to Moultan, Pakistan.
Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.
Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.
Project: 145-mile line from Sylhet to Dacca, East Pakistan.
Status: Under consideration. If approved construction could start December 1958.

- **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venzuela.**

Project: 207 miles of 26-in. from Anaco fields to Caracas.
Status: Under way.
Contractor: **Williams Brothers Co.** has part.
Completion: Spring 1959.

- **Union of Soviet Socialist Republic.**

Project: 808 miles of 26-in. from Stavropol in the Northern Caucasus to Moscow, to serve Voroshilovgrad, Voronezh, Tula, Yelets, and Serpukhov.

- **Yacimientos Petroliferos Fiscales** (Argentina)

Project: 1,015 miles of 24-in. from Camp Duran to Buenos Aires.
Status: To start first quarter 1958.
Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.)
Completion: Mid-1960.

Among the Drilling Contractors

Mr. Luke, Webster Drilling Co.'s new drilling barge in Orange, Tex., shipyard before leaving for first drilling job south of New Orleans.

New Drilling Barge to Work on Louisiana Coast

Webster Drilling Co., Houston, is putting a new submersible drilling barge to work in Louisiana's coastal waters south of New Orleans. Named "Mr. Luke" for Luke Halpain, the company's general superintendent, it is Webster's first drilling unit of this type.

Built in Levingston Shipbuilding Co.'s yards at Orange, Tex., the barge is a slotted-type vessel, 180 ft. long, 48 ft. wide, and 12 ft. deep. Its equipment, centered around an Emsco J-1400 rig, powered by Caterpillar D-397 engines, is designed for 16,000-ft. drilling.

Kirkwood & Morgan, Inc., San Antonio, will drill Morris C. Minton's projected 5,500-ft. wildcat test east of Mathis, in western San Patricio County, South Texas. Location is at 1 Patteson, in Lot 9, Motzenbaugh Subdivision, M. P. and J. M. Delgado Grant, A-4.

Grey Wolf Drilling Co., Houston, has taken on a 11,500-ft. contract operation in eastern Jefferson Davis Parish, South Louisiana. There, it will drill for J. S. Michael, also of Houston. Its location, at 1 Davis Unit, in 14-9s-3w, is about 1½ miles northwest of the recently completed discovery well of North Jennings field. The latter well is productive of gas and condensate from a 10,600-ft. sand. These wells are west of the old Jennings field, across the line in Acadia Parish.

Flourney Drilling Co., Alice, Tex., has contracted for a 7,500-ft. test to be drilled for Lawrence E. Hoover, of Corpus Christi, at a rank wildcat location in southwestern Kenedy County, in Texas' lower coastal area. Location is for 1 M. F. Garcia, in the San Juan de Carricitos Grant, Share 59. It is about 2,000 ft. north of the Willacy County line, and about 9 miles northwest of Raymondville, in the latter county.

Zach Brooks Drilling Co., El Dorado, Ark., has moved a heavy rig from Citronelle field, in northern Mobile County, Alabama, to a wildcat location within the city limits of Mobile, 25 miles south, where it will drill a 12,700-ft. Rodessa test for Southwestern Oil & Refining Co., of Corpus Christi, Tex. Southwestern's test, already spudded with a light rig, is listed as 1 Cora Miller-City of Mobile. Spot is in 33-3s-2w.

Gulf Coast Drilling & Exploration Co., Laurel, Miss., is on its third contract for Skelly Oil Co. and Kin-Ark Oil Co. in the new Dexter field, on the Walthall-Marion county line, in southwestern Mississippi. The new operation, 1 Pittman, is a south offset to the operators' discovery well, com-

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If mud gets to your joint threads, it can wash out a string in a hurry. 'Bestolife Lead Seal Tool Joint and Casing Compound gives maximum, tight joint make-up, keeps mud out. Standard of the oil country for over twenty-five years. Unconditionally guaranteed. Packed in 1¼, 5, 20 and 50 lb. containers. Sold by leading supply houses throughout the world.

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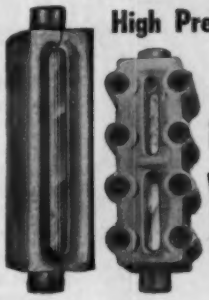
SAFEST High Pressure Gage in the World



Gage glass in Inferno gages is 1" thick, especially tempered and heat treated. This glass is held in the gage by equal pressure on both sides around the entire edge of the glass. The body is available in three different metals, and is machined from solid bar stock. Write for Bulletin 33.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

pleted last March with gas and condensate production from Tuscaloosa sand at 9,550 ft. and Paluxy sand at 13,500 ft. The rig comes from the newly completed northeast offset to the discovery well. Hole on the third test is projected to 15,700 ft. for a look at the Rodessa.

Drilling & Exploration Co., Dallas, is getting under way on the first of two deep tests it has contracted to drill for Dudley T. Dougherty in Warren County, western Mississippi. Its rig now is on 1 Sanders, in 6-16n-5e, about 6 miles east of Vicksburg, where a 10,900-ft. Lower Cretaceous test is projected. Upon completion of this test, the rig will go to 1 Howard Hinston, in 11-18n-5e, about 15 miles northeast, for which the operator has a 10,250-ft. permit.

Allen & Morris, San Antonio, are getting started on another deep Edwards test for Amerada Petroleum Corp. and Monterey Oil Co. in the Lowe Ranch field, southwestern McMullen County, Southwest Texas. The new test, 1-B Grimes, is the third for these operators in this area. It follows the recent completion of the operators' 1 Grimes, abandoned at total depth of 14,882 ft. after a series of unsuccessful tests. Their initial well, completed in September 1956 as a gasser at total depth of 14,479 ft., was the deepest producer in Southwest Texas.

Jett Drilling Co., Shreveport, has contracted for a 14,000-ft. Hosston test to be drilled for Monterey Oil Co. in southwestern Simpson County, South Mississippi. Location is about 3 miles south of Pinola, in 13-10n-20w. It is Monterey's 1 Brown-Gaylord.

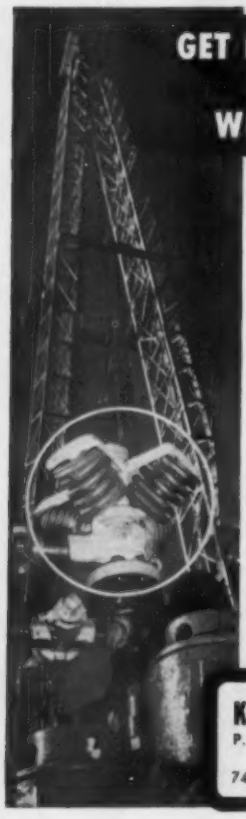
Coulston Drilling Co., Tyler, Tex., has a rig working on a new contract operation in eastern Shelby County, East Texas. It is a 6,500-ft. Travis Peak test for Peyton McKnight, Jr., of Tyler. Location, at 1 Leggett, in the Robert Herriot Survey, is about 6 miles southeast of Joaquin.

Gilger Drilling Co., Houston, has the contract on another test H. L. Hawkins, also of Houston, will drill in the South Lake Arthur area, in the northwest corner of Vermilion Parish, Coastal Louisiana. Its location, at 1 Price Unit 2, in 27-11s-3w, is 4,000 ft. northeast of Hawkins' discovery well, completed in 1955 as a gas well from a 10,570-ft. sand. The latter well has been shut in since completion. Two dry holes have been drilled. Permit on the new test is for 12,500 ft.

Sooner Well Service Co. is drilling a 7,500-ft. wildcat test 3 miles east of Sinton, in San Patricio County, South Texas. It is a contract job for Engeo Oil & Gas Co., of Corpus Christi. Hawn Brothers and Pratt-Hewitt Oil Corp. are associated with Engeo in the project. It is at 1 Brittain, in the James F. Gravis Survey.

John W. Mecom, Houston, has a rig on a contract operation 5 miles north of Anahuac, northwestern Chambers County, Texas Gulf Coast. He is drilling for Earl T. Mackey at 1 Tompkins, in the Moses A. Carroll Survey. Location is north of Turtle Bay field. A 10,500-ft. test is planned.

Crow Drilling & Producing Co., Shreveport, is working on a new contract job in Catahoula Parish, eastern Louisiana. It is a 5,600-ft. Wilcox test for Jones-O'Brine, Inc., also of Shreveport at 1 J. M. Whately Estate, in 16-8n-6e. Location is about 3¾ miles northwest of Jonesville. It is 2 miles southwest of Tew Lake field.



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The Model 112 Kinzbach Automatic Pressure Relief Valve for Mud Pumps gives positive, instantaneous pressure relief at maximum volume and automatic restoration of circulation upon correction of the overpressure condition. All elements of the circulating system are protected from excessive pressure at all times.

Services utilizing extremely high pressures such as acidizing, cementing and fracturing find the Model 112 meets their safety requirements.

Kinzbach Model 112 Pressure Relief Valves come in 2" and 3" sizes and pressures ranging from 500 psi to 16,500 psi. Write for complete catalog or see your Composite Catalog.

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SHOWCASE...

NEW EQUIPMENT

Big Payloads Featured in Business Planes

Cruising at a speed of 228 m.p.h., the new F50 Beechcraft Twin-Bonanza shown here is one of four new business planes just introduced. The others are the Super 18, Travel Air, and the J35 Bonanza.

The F50 is powered by two supercharged 340-hp. Lycoming engines. Its features include an optional propeller unfeathering system. This system incorporates an air-oil accumulator which enables the pilot to unfeather a propeller and start the engine without using the starter. It carries more than 2,540 lb. of useful load, including 1,400 lb. for passengers and baggage. Four to seven persons can be accommodated.

The Super 18 executive transport is the largest of the four planes. Its range is 1,626 miles. Powered by two 450-hp. supercharged Pratt & Whitney engines, the transport has a cruising speed of 215 m.p.h. It is normally an eight-place plane. Service ceiling of the Super 18 is 23,300 ft. at its gross weight of 9,300 lb. It can carry more than a ton of useful weight or payload.

The Travel Air Model 95 is powered by two 180-hp. Lycoming engines. Its cruising speed is 200 m.p.h. Gross weight is 4,000 lb. and useful load is 1,420 lb. The Model 95 has a nonstop range of more than 1,400 miles.

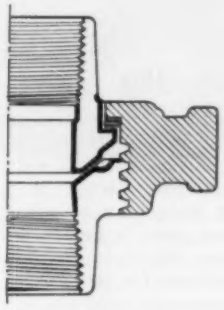
The J35 Bonanza is equipped with continuous fuel injection. A four-place plane, it cruises at 200 m.p.h. Power is supplied by a Continental 6-cylinder, 250-hp. engine. **Write or call: Beech Aircraft Corp., Wichita, Kans., for details on new business planes.**

Insulated Union Quickly Changed

Designed to stop the flow of stray electrical currents through it and so prevent electrolytic corrosion, the union has an extremely tough epoxy phenolic plastic coating on the sealing surfaces and exposed internal areas.

The coating withstands temperatures up to 250° F., the maker reports. It has a high resistance to impact, abrasion, and erosion, and has exceptional chemical resistance to oilfield brines, acids, and strong caustics.

Uses for the union include: flow, water flood, and salt-water-disposal lines; christmas trees; headers; manifolds; and other piping. Acme threads on the three-lug wing nuts allow fast, easy make and break.



The connections are line-pipe threads made to API specifications. The unions come in 1,000 and 2,000-psi. test pressures in sizes from 1 to 4 in. **Write or call: Guiberson Corp., one of the Dresser Industries, P. O. Box 1106, 1000 Forest Avenue, Dallas, for details on insulated unions.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of **December 23, 1957**

NAME..... TITLE.....

COMPANY.....

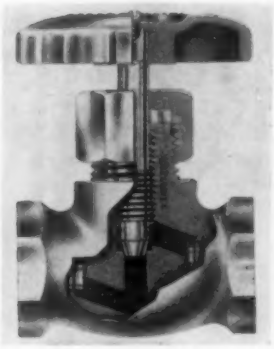
ADDRESS.....

CITY..... STATE.....

DATE.....

SHOWCASE . . .

New Equipment



Needle Valve Fits In Tight Spots

A working pressure of 10,000 psi. is offered by this globe-type needle valve. It is suited for use with a gage or for metering service in gas, oil, or water lines. It was developed for use where space is limited and operating areas are close.

It is suitable for use in meter boxes, in pressure-gage controls, in laboratories as a sampling valve, and in other applications where a high-pressure accurately controlled needle valve is required.

Designated as Type N-28, the valve features a one-piece solid-forged carbon-steel body with a 12/14 chromium heat-treated stainless-steel stem and Teflon packing. Short and compact, the valve comes in sizes of ⅛ through ½ in. Its maximum working pressure of 10,000 psi. is at 70° F. Its maximum operating temperature is 500° F. **Write or call: Kerotest Manufacturing Co., 2525 Liberty Avenue, Pittsburgh 22, for details on Type N-28 needle valve.**

●

Solenoid Valve Takes High Pressure

The housing on this new valve is designed for hazardous areas. Available valve ratings for oil and water are: 0 to 250, 0 to 1,500, and 0 to 3,000 psi. Rating for air are: 0 to 250, 0 to 1,000, and 0 to 1,500 psi. Flow patterns available are: four-way, three-way, shutoff, and diverter. Standard a.c. voltages are 110, 220, and 440 volts.

The valve features the Shear-Seal design. In this design, a sealing ring is in constant, intimate contact with a mating slide. The metal-to-metal sealing surfaces continue to lap themselves with each operation, maintaining their sealing qualities for many cycles. **Write or call: Barksdale Valves, 5125 Alcoa Avenue, Los Angeles 58, for Catalog 58-59.**

"Okay—we furnishum pipe on deal."

ALL-NEW D&S TRI-DIA BIT!

faster penetration, more rig savings

Designed for safety

Reduced O D wall contact approaches that of Tri-Cone Rock Bit.

Eliminates swabbing, hydraulic action when making trip.

Permits washing out large junk iron pieces, minimizing that hazard.

Readily washes out cavings to bottom.

Reduces mud wall cake sticking hazard.

Largest measurable diameter materially less than diameter of hole it will cut. (Special Bit Breaker required.)

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OFFICES IN ALL PRINCIPAL OIL AREAS

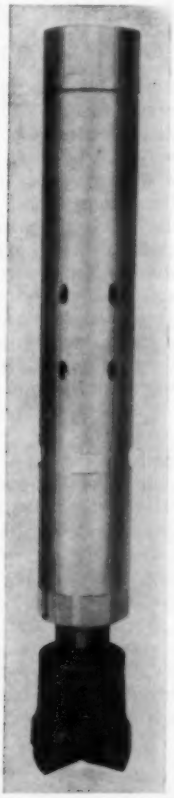
SHOWCASE . . .

New Equipment

Drill Quickly Bores Hard Strata

According to the maker, field reports indicate the new percussion type of drill for seismograph rigs is able to bore with unusual speed, even in hard formations, because of the extremely high amount of energy delivered to the bit, plus the drill's unusual hole-cleaning ability.

When hard formations are encountered, the Mole-Dril may be attached to the drill-stem in place of the rotary bit.



The drill stem conducts the compressed-air supply and rotates the drill. A tungsten carbide inset bit attaches to the tappet and forms an integral part of the drill.

Two models of the drill are currently available—AM-4 and AM-6. Model AM-4 weighs 98 lb., is 35½ in. long, has an outside diameter of 4 in., and uses a 4¾-in. bit. Model AM-6 weighs 200 lb., is 39 in. long, has a 5¾-in. o.d., and uses a 6½-in. bit. **Write or call: Gardner-Denver Co., Quincy, Ill., for details on Mole-Dril.**

Line Pipe Available In 60-Ft. Length

Sizes range from 6⅝ to 12¾ in. in this electric-weld line pipe. It's suited for the transportation of crude oil, refined products, and gas. The new mill in which the pipe is made is said to lend itself to the manufacture of line pipe with light, uniform walls.

Pipe lengths up to 69 ft. can be obtained to reduce the number of field welds. The pipe meets the requirements of API standards 5-L and 5-LX. **Write or call: Jones & Laughlin Steel Corp., Three Gateway Center, Pittsburgh 30, for details on electric-weld line pipe.**

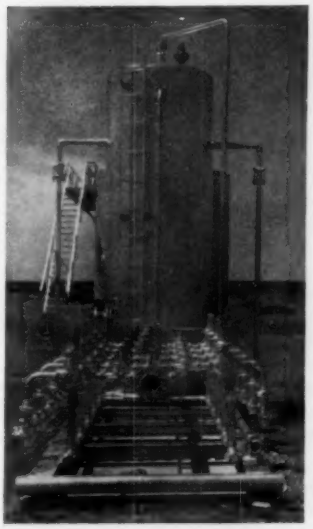
●

Well Tester Operates Automatically

Known as the Siv-O-Matic, the well tester consists of well-switching manifolds, test-metering separator, and control panel. These are all mounted on the skid.

The manifold connects to the metering-test separator mounted on one end of the skid. The unit can also include a production separator mounted on the opposite end of the skid and connected to the manifold.

All wiring for the electric control panel is installed in explosionproof conduit and tested in the shop. The well-switching valves are pneumatic three-way motor valves. They are controlled by electric solenoid pilot valves which are controlled by the test-programing system in the control panel. Data measured by the meters in the test separator are recorded on a strip chart in the control panel.



When assembled and tested, the unit is ready for delivery to the lease intact. The maker's standard units have been cataloged for manifolds of 8, 12, or 16 wells.

The manifolds may be obtained with either 125-lb. ASA three-way two-position motor valves for low-pressure pumping wells or 1,500-lb. WOG three-way three-position motor valves for high-pressure flowing wells and intermitters. **Write or call: Sivalls Tanks, Inc., Box 1152, Odessa, Tex., for details on automatic well tester.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of **December 23, 1957**

NAME.....TITLE.....

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SHOWCASE . . .

New Literature

Separator-Dehydration Units Equipped with a Glycol-Driven Pump are described in new Catalog G. The dehydrator features an inlet separator with efficient liquid-removal and mist-removal sections. The glycol-regenerator heater features a gas-fired reboiler, automatic temperature controller, and internally refluxed fractionating column which efficiently separates glycol and water. The catalog contains a nomograph for determining the circulation rate for glycol dehydration units and a graph of the water-vapor content of natural gas at saturation. **Write or call: Petroleum Engineering & Tool Co. of Houston, Inc., 2521 Wroxton Road, P. O. Box 6745, Houston 5, Tex., for Catalog G.**

●

Heavy-Duty Rotary Pumps with capacities to 25 g.p.m. and pressures to 500 psi. are described in new Bulletin 2064-B1. The pumps feature nodular iron herringbone gears for maximum wear resistance and a single stuffing box with adjustable packing or mechanical seal to assure minimum leakage. Steel-backed bronze wear plates can be easily replaced to restore pump clearance. The bulletin gives typical speeds, capacities, pressures, and power requirements as well as dimensions of the bare pumps. **Write or call: Worthington Corp., Harrison, N. J., for Bulletin 2064-B1.**

●

Three-Cone Rock Bits are reviewed in a new four-page, two-color bulletin. Five types of bits are described, ranging from Type BD-1 for unconsolidated formations and intermediate limestones to Type BD-5 for extremely hard, abrasive formations. High-hardness steel alloy, with superior wear-resistant properties after heat-treating, is used in the cone and head forgings. **Write or call: Herb J. Hawthorne, Inc., P. O. Box 7366, Houston 8, for Three-Cone Rock Bits bulletin.**

●

Telemetering and Supervisory Control Catalog 971-100 describes a single master station which will remotely measure a process taking place and transmit the data to a control point. The instrument is designed to measure pressure or vacuum, temperature, position, weight, speed, or flow. It can also control operators, valves, circuit breakers, controllers, or motors. The system will also set off an alarm where there are off-normal temperatures, pressures, flows, or levels, and when there is off-normal operation, power failure, motor failure, vandalism, or overload. Typical design and operation specifications are included in the catalog. **Write or call: Applied Science Corp. of Princeton, P. O. Box 44, Princeton, N. J., for Catalog 971-100.**

●

Fire-Resistant Synthetic Lubricant for Air Compressors — Pydraul AC — is described in a new booklet. Carbon deposits on exhaust valves and in interstage equipment are drastically reduced with the lubricant's use, the booklet states. By minimizing carbon deposits and resisting oxidation, the lubricant also serves to eliminate what are believed to be the basic causes of explosions and receiver fires in air-compressor systems. The autoignition temperature of the fluid is greater than 1,100° F. **Write or call: Monsanto Chemical Co., 800 N. Twelfth Boulevard, St. Louis, for Pydraul AC Booklet.**

●

Process Control by Analytical Instrumentation is an eight-page illustrated article which examines nuclear-magnetic resources and other new analytical processes as improvements in control and detection techniques. Non-spectroscopic methods and instruments discussed in the article include thermal catalytic converters; flow colorimeters; thermal conductivity; moisture-in-gas analysis; sonic; ionizing radiation; and refractometers. Spectroscopic methods and techniques are detailed, covering: infrared; mass spectrometry; vapor chromatography; radio-frequency spectroscopy, including nuclear-magnetic resonance; X-ray spectroscopy; ultraviolet spectroscopy; and nucleonic. **Write or call: Schlumberger Well Surveying Corp., Ridgefield, Conn., for "Process Control by Analytical Instrumentation" article.**

●

Earth Anchors Bulletin OS-1 describes screw, plate, and expanding anchors used to secure drilling rigs, or service masts, derricks, and pipelines. These earth anchors eliminate the costly man-hours that go into making deadmen and also eliminate the risk element that exists with deadmen, according to the maker. The bulletin describes pipeline-screw anchors and brackets and tank-anchor sets. Information about swamp-screw anchors and rock anchors is detailed, as well as facts about installation tools. Soil anchor-holding capacities are outlined in easy-to-read charts. **Write or call: A. B. Chance Co., 210 North Allen Street, Centralia, Mo., for Bulletin OS-1.**

●

Pumping Units Bulletin describes the Hamer UZ-DR64A pumping units and structural gear-reducer specifications. The units feature a removable head for well clearance, a heavy frame structure for trouble-free service, heat-treated alloy-steel helical gears, a large-diameter sheave to give low pumping speeds when using a 1,750-r.p.m. motor, and heavy-duty self-aligning bearings. **Write or call: Hamer Mfg. Co., 5504 Forest Hill Drive, Fort Worth, for Model UZ-DR64A pumping units Bulletin.**

●

Triplex Pumps Type F-30 are presented in new Bulletin 473. Design, performance, specifications, oil-field applications, and a selection chart are included in the four-page, three-color bulletin. The pumps are of high-test cast iron with a heat-treated forged-steel crankshaft. The plunger-type pump is suitable for water flooding, salt-water disposal, power-oil service, and many other oil-field services, according to the maker. **Write or call: National Supply Co., 2 Gateway Center, Pittsburgh, for Bulletin 473.**

●

Use of Aluminum for Tanks and Vessels is outlined in a new 16-page booklet. The booklet serves as a basic technical guide to design, fabrication, and applications of aluminum tanks and vessels. It lists more than 100 general types of chemicals for which aluminum applications are particularly advantageous. **Write or call: Reynolds Metals Co., 2500 South Third Street, Louisville, Ky., for "Reynolds Aluminum for Tanks and Vessels" booklet.**

●

Solid and Open Steel Flooring—for floors, stairs, steps, ramps, catwalks, platforms, and similar applications—is described in new Bulletin 50-9. The bulletin includes tables of safe loads and other engineering data. Illustrated are the four-way, raised-lug-pattern, solid-steel safety plate, and nine different styles of open material. Plate and panel sizes, construction advantages, suggestions for ordering, and fastening methods are shown in the eight-page bulletin. **Write or call: Joseph Ryerson & Son, Inc., Box 8000-A, Chicago 80, for Bulletin 50-9.**

EQUIPMENT MEN ..... IN THE NEWS

Joe Smith Made Manager Of New Bovaird Store . .

at Farmington, N. M. This new style standard store has just been completed and is now entirely stocked to meet the needs of drilling and production in the Four Corners area.

Smith, with 10 years' experience in the oil-field-supply business has been with Bovaird Supply Co. 6 years.

Ronal A. Boze Named Delta Tank Sales Engineer . .

in the Westwego, La., oil-field-equipment division office. According to Ross B. Baze, vice president, Boze has been active in oil-field-equipment engineering work since 1953.

Delta Tank Manufacturing Co., Inc., a wholly owned subsidiary of General Gas Corp. of Baton Rouge, is a leading producer of pressure vessels and other heavy equipment for the petroleum, chemical and petrochemical industries.

I. D. Abshire, Don Wilson Transferred by Weco . .

and will be responsible for the sale of Weco unions, blocks and compounds as well as Chiksan swivel joints, steel rotary hoses and mud guns.

According to John W. Gates, sales manager of Well Equipment Manufacturing Corp., Abshire moves from the North Texas area to the Rocky Mountain territory, headquartering at Casper, Wyo. Wilson moves from Casper to Wichita Falls to serve the North Texas area.

H. R. LeMay & Co., Inc., Named Pritchard Agent . .

for the South Texas and Southwest Louisiana territory. J. F. Pritchard & Co. of California, a division of J. F. Pritchard & Co., Kansas City, Mo., manufactures cooling towers for air conditioning and industrial applications and Pritchard Hydryers, packaged dehydration units for drying air and other gases.

LeMay will concentrate on cooling-tower sales for air-conditioning applications to engineers and contractors.

C. J. Schleeweis Named by Worthington Corp. . .

as general sales manager of its Wintroath Pumps Division.

Schleeweis has a broad background of experience, having served as sales manager of Johnston Pump Co. and in other executive capacities for the past 9 years. Previously he was associated with Fairbanks, Morse & Co., Inc. Schleeweis has traveled throughout the world and in this country promoting the manufacture and sale of this type of equipment.

George Engine Co. Sells This Newest Crewboat . .

to a major drilling contractor for overseas operations.

According to H. F. Colby, executive vice president and general manager, the new Sewart Seacraft crewboats have a top speed of 25 m.p.h. and a cruising speed of 22 m.p.h. loaded. Fifty-five feet long, they are twin screw, with 600 shaft horsepower of GM diesel engines.

George Engine has several of the new crewboats on order for local delivery or export and offers custom-powering services.

Broderick & Bascom Rope Co. Elects Sieber . .

vice president in charge of sales, with K. B. Britt succeeding him as sales manager. According to Joseph H. Bascom, president, J. J. Sieber and Britt have been with B & B for many years.

J. J. SIEBER

K. B. BRITT

Name of Wyatt's Mexican Subsidiary Is Changed . .

from Productos de Hierro y Acero, S.A., to Wyatt de Mexico, S.A. de C.V. The firm, whose plant is at Tlalnepantla, Estado de Mexico, outside Mexico City, was purchased by Wyatt Metal & Boiler Works, Dallas and Houston, earlier this year.

Officials of Wyatt de Mexico are T. J. Uhl, Jr., president and general manager; Juan M. Steta, secretary and director; and Augustin Santamarina, director.

Uhl was production manager for Wyatt's Dallas plant prior to his move to the subsidiary in Mexico.

B. F. Fahey, Jr., Named By Southern Engine . .

B. F. FAHEY, JR.

as assistant sales manager.

According to D. N. Wommack, president of Southern Engine and Pump Co., Fahey previously was with A. M. Lockett & Co., Ltd., as an application engineer. Fahey gained actual shop experience when he was employed by Parkersburg Rig & Reel Co. as a plant workman.

Electro-Tech Adds Gravity Measuring Device . .

to its list of products by acquisition of North American Geophysical Co. of Houston. According to D. D. Mize,

general manager, this allows Electro-Technical Labs to give greater coverage in the field of geophysical instruments.

Electro-Tech, a division of Mandrel Industries, Inc., manufactures, markets and services all types of geophysical equipment. The firm has sales and service offices in Lafayette, La., and Tulsa. Recently an office was established in Paris, France, staffed by American engineers and headed by Gene Florian, European sales manager.

Mario Cueto Named Export Sales Manager by Reed . .

MARIO CUETO

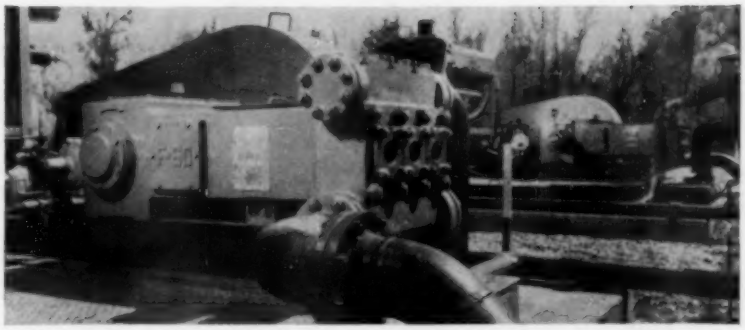
and will transfer to the company's export sales headquarters in New York about January 1. Prior to this appointment, he was special sales representative for Reed Roller Bit Co. in Buenos Aires, Argentina. According to Howard Book, vice president, sales, Cueto joined Reed in 1940 as a salesman in Buenos Aires. He was successively district manager, special salesman and special sales representative in Argentina, Bolivia, Brazil, Chile, Ecuador, and Peru.

Cueto's new duties will include coordination of all export sales functions and management of Reed's export staff. Reed has export sales offices in London, Buenos Aires, Maracaibo, and Anaco, Venezuela, and sales agents in Germany, Italy, Spain, Australia, New Zealand, Brazil, Bolivia, and India. Reed recently opened a new rock-bit-manufacturing plant at Leiden, Nederland.

Oil Well Supply Division Appoints in Two Areas . .

of its operations. William W. Eggleston has been named district representative at Corpus Christi, Tex., according to M. F. Jones, Gulf Coast area manager. Walter M. Haynes has been employed as district engineer, refinery and pipeline sales, at Shreveport, La., it has been announced by William Miskimins, Central Midwest area manager.

Eggleston joined Oilwell in 1952 at Mirando City, Tex., and was transferred to Mission, Tex., later that year. Prior to his present appointment, he was field representative at the Corpus Christi store. Prior to his recent appointment, Haynes had 30 years of engineering experience.



South Louisiana Project Uses National Pumps . .

to put water into two injection wells on a pressure-maintenance project. In the foreground is an F-60 triplex pump and in the rear an F-90 triplex pump made by The National Supply Co.

Other major pieces of equipment used in conjunction with the two pumps on the project include a precipitator, a pressure-type graded sand and gravel filter, and two storage tanks for the filtered water. Centrifugal pumps handle the water through the system to the triplex pumps.

R. G. LeTourneau, Inc., Fills Export Post . .

R. A. BEVER

by naming Robert A. Bever as export sales representative. Export Sales Manager F. G. Evangelist said Bever's appointment is the result of LeTourneau's expanding foreign activity in the heavy equipment field.

Bever spent 8 years as Caterpillar Tractor Co.'s district representative with the company's Middle East sales and service organization. Later he returned to the firm's Peoria headquarters where he worked on the export sales staff. Immediately prior to joining LeTourneau, Bever conducted a survey of the sales potential in Scandinavian countries, Europe, Belgian Congo and South Africa.

Matheny Joins Ideco . .

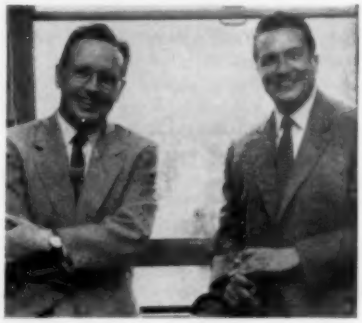
in Long Beach, Calif. Shannon L. Matheny, Jr., has been appointed by Ideco, Inc., as technical service engineer.

Schlumberger Moves La. Motor Vessel District . .

from Buras to Venice, La., to facilitate service in inland areas. Manager of the district is H. H. Ham.

Other motor vessel districts are located at Houma and Franklin, La. Schlumberger Well Surveying Corp.'s motor vessels, which serve rigs drilling in inland waters, contain complete logging units and living quarters for crews. Some are self-propelled and others are of the barge type which are towed by tug.

Named as Arkansas sales engineer is W. G. (Bill) Graves. He will be stationed at Magnolia.



Entrepose Co.'s Manager Visits Crose Plant . .

in Tulsa during an inspection trip of equipment manufacturing and construction activity in the United States.

J. L. Guyot (right), general manager of France's leading pipeline construction contractor, is shown here with John Manley, export sales manager for M. J. Crose Manufacturing Co., Inc. Assisting Guyot in addition to Manley were: D. M. Curran, president; Clare Miller, vice president; and John Behrenfeld, sales manager.

According to Guyot, his firm has been laying 10 and 6-in. pipe in Iran, with the southern section being built by Williams Brothers Co. of Tulsa. Entrepose will lay 90 miles of 12-in. line from Abadan to Ahwaz next year. The firm also has contracted for a joint venture with SPIE to construct a 300-mile 24-in. line from South Algeria to the coast. Entrepose has established an office in Algiers and now has a temporary spread in the area. Guyot will inspect several jobs in progress across western United States before returning to the firm's Paris headquarters.

INSPECTING Sikorsky rotor blade spars calls for painstaking study of every inch of surface. A Borescope enables this inspector to see inside the whole 33-foot length of this spar.

First in Skills for Helicopter Quality

OIL RIG OPERATION has proved the abilities of big Sikorsky transport helicopters. The S-58 above carries 12 passengers or 2 tons of cargo. Eliminating the need for roads, it recently lifted crews, sectionalized rigs, and all necessary equipment including a bulldozer to drilling sites in the New Guinea jungle. Then it continued to fly in all supplies. Offshore in the Gulf of Mexico area, S-58s and 7-place S-55s are carrying more than 27,000 passengers monthly.

As the pioneer helicopter builder, Sikorsky Aircraft has accumulated helicopter production and engineering skills unequalled in the world of aviation—skills that insure the highest possible helicopter performance and dependability.

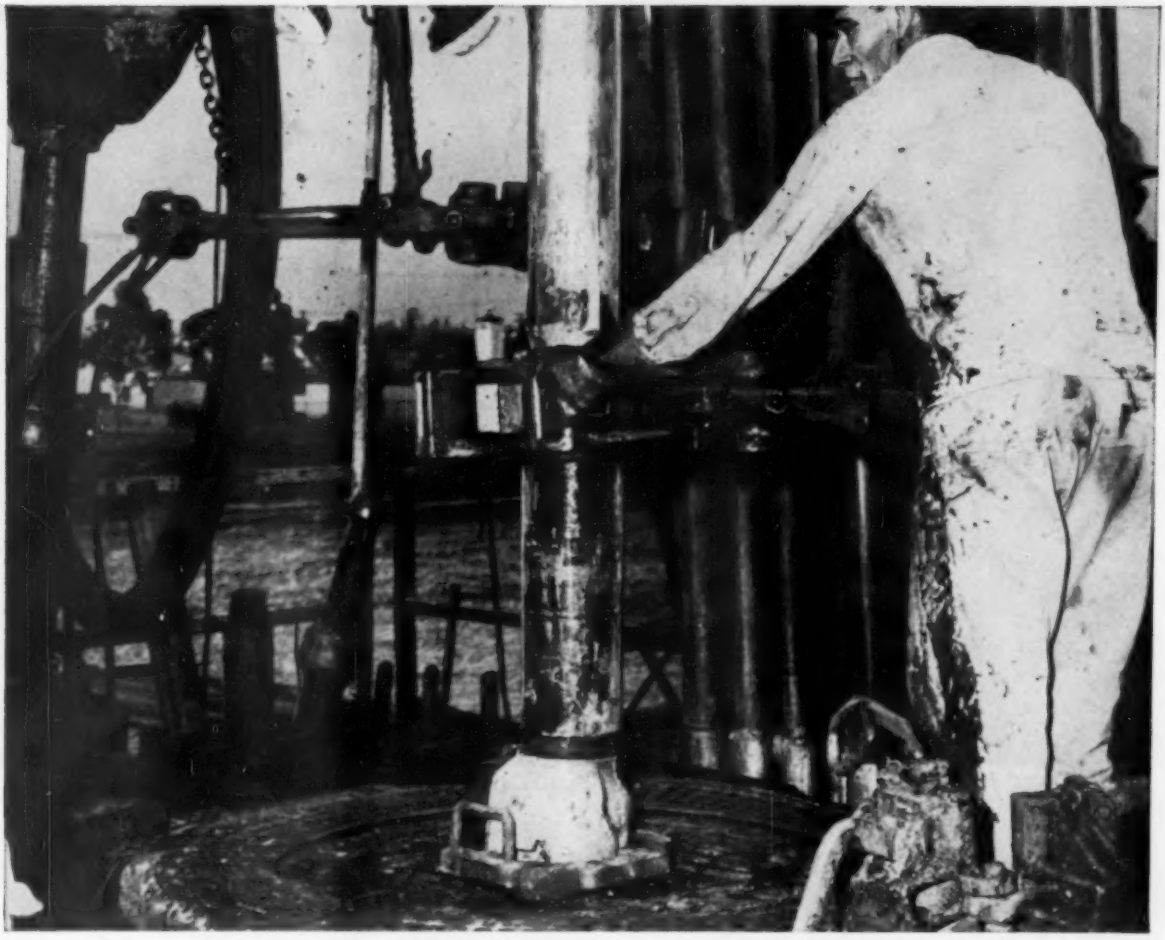
Specialists in Sikorsky's rotor blade department, for instance, have the experience and facilities they need to produce the world's finest blades. Detecting even minor nicks or scratches helps prevent metal fatigue failure—so this department has one engineering inspector for every nine production employees, well above the national average. They use a variety of ingenious devices, including a Profilometer to check smoothness, a Borescope to peer through the blade's length, a Vidigage to check the thickness of extrusions electronically, an Inclinometer to check the twist of the blade. As a result, Sikorsky's rotor blades, all metal and individually interchangeable, have proved their stamina in more than a million hours of operation, in every climate.

Sikorsky's engineering and production skills have made the world's most useful helicopters available to industry, to airlines and to the armed forces. They insure dependability, more hours in the air, more productive utilization. If you have a problem involving moving men or materials offshore or over difficult terrain, write for more information on how well Sikorskys can do the job.

SIKORSKY AIRCRAFT

STRATFORD, CONNECTICUT

One of the Divisions of United Aircraft Corporation



This drill collar is permanently non-magnetic...it's "K" Monel

Do what you like...

Cool a "K" Monel* age-hardenable nickel-copper alloy drill collar down to arctic temperatures. Heat it to the temperatures encountered in the bottom hole of the deepest wells! "Cold work" it! Stress it! Vibrate it!

Nothing *you* do will boost the collar's magnetic permeability much above 1.0015 (approximately the permeability of air). Factors that boost magnetism in other metals have no effect on the non-magnetic properties of "K" Monel alloy.

It's plain to see why "K" Monel collars are preferred for directional drilling. No survey errors introduced by magnetism in the collar! What's more "K" Monel alloy collars have the strength to take the strains of whipstocking. Subject it to strong magnetism . . . and the wear-resistance to stand up against abrasive sands and chips.

Then, too, "K" Monel alloy is 10% denser than steel . . . concentrates weight right where you want it, just above the bit.

Next time you deviate a hole, specify "K" Monel alloy drill collars. You can get them...and plenty of help with directional drilling problems, too . . . from the Servco Company, Security Building, Long Beach 2, California.

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INCO

INCO NICKEL ALLOYS

Canadian Strikes Packed a Wallop in 1957

By Frank J. Gardner
Exploration Editor

AS THE CURTAIN descends on 1957, Canadians can look back on a rewarding year, despite an over-all decrease in drilling, depressed allowables, imprisoned gas, and a chronic case of the blues throughout the industry. These things will evaporate. And when they do, we can look for Canadian oil to resume its dynamic upward course. In the face of a host of negative factors, some vitally important strikes were made in 1957 . . . strikes whose full impact may not be felt even in 1958.

Two such centers of discovery interest are pictured on the maps below. Each of these regions spouted headlines in 1957; each one is still in the embryonic stage; and each one packs a discovery wallop—one of oil and one of gas.

Five flush hits . . . A crop of five prolific wildcat oilers has thrust the Virginia Hills region to center stage. It all began last February when Home Oil Co., Ltd., et al hit at its 9-20 Virginia Hills (Section 20-65-13w5), a 1,200-bbl. well producing from Slave Point-Middle Devonian at the 9,300-ft. level; it was the first well ever to find commercial oil in that formation. Only a couple of weeks later, the same operator announced success in the Slave Point at its 8-11 Swan Hills wildcat, 25 miles northeast of the first strike (Section 11-68-10w5); this one still is not finally finished.

Following this one-two punch, Home drilled a 5-mile stepout northeast of Virginia Hills and another 5-mile stepout southwest of Swan Hills; the first was a failure, but the second resulted in the Edith Lake discovery, also from Slave Point; this one flowed 1,392 bbl. daily from perforations at about 8,300 ft.

Meanwhile, 35 miles to the southwest, two more Slave Point wildcats spewed forth; at its 1 Kaybob (Section 22-64-19w5), Phillips Petroleum hit a 110-bbl. per hour flow at 9,600 ft. This happened in May. Near the end of September, California Standard Co. and British American Oil Co., Ltd., added the fifth Slave Point strike at their Iosegun River venture (Section 33-63-19w5). This one, only 4½ miles south of the Kaybob, flowed 130 bbl. per hour on test at 9,900 ft.

Will spell a notable 1958 . . . These five flush discoveries are Exploration Story No. 1 in Canada for 1957; now, with the approaching annual freeze-up, Canadian operators are mapping a brisk campaign of follow-ups and rank wildcats throughout this vast virgin region. A look at the map reveals a round dozen of these ventures already announced or turning.

Turning to the second center of interest, we find a giant gas field developing in the Waterton-Castle River area . . . one that may dwarf even Pincher Creek, Canada's largest. Here, Shell Oil Co. has just tested its second gasser at Waterton.

These are Rundle - Mississippian wells at the 11,000-12,000-ft. level. Ten miles northwest, Texaco Exploration Co. found gas-condensate production at its A-3-4 Castle River last summer, and just recently at its A6-15-5-2w5 Gladstone Creek; these too are Rundle wells at about the same level, and indications are that a field 14 to 15 miles in length may be emerging in this Foothills region.

And an end to the blues . . . Such discoveries as these are evidence enough that western Canada holds the key to the future of oil in North America. These are positive blows against the blues.

THESE two regions, Virginia Hills (left) and Waterton - Castle River (right) were the top exploration news in Canada in 1957. Five prolific oil strikes, all from the same formation, highlighted the Virginia Hills region, while four huge gas discoveries in a straight line reveal a mammoth gas field, even larger than Pincher Creek, emerging at Waterton-Castle River.

Exploration Picture Bright for geophysicists as prospecting activities outside North America continue to expand

By Roy Bennett

GEOPHYSICAL activities outside Canada and the United States increased 25 per cent in 1956 reaching a 340-crew average. Reports of activities indicate further gains in 1957 as more areas become available to the prospector. Success is assured in many of the relatively unexplored petroliferous basins of the world. Major discoveries are reported constantly from new areas. The oil industry in the United States on the whole, however, had a rugged "go" the first half of 1957.

Domestic demand increased only 1.1 per cent compared to the 5 per cent expected. United States production of crude hit 7,525,000 bbl. daily due to the Suez situation but cut back sharply in the last half. Texas production has been reduced to 12 days' allowable.

Stocks of crude oil and refined products were at a record level tying up needed capital and causing "soft" markets.

Refining continued to require large investments for manufacturing facilities to stay in the octane race.

United States drilling received the greatest cut—25,761 wells were completed, a drop of 3,077 from the same period in 1956. Wildcat drilling suffered its greatest first-half decrease since World War II. In the U. S., 5,814 wildcat wells were completed as compared to 6,301 in 1956—a reduction of 487 exploratory tests.

Financing was difficult. Earnings were up early in the year but readjustments following the Suez crisis and general business-downturn forecasts reduced profits for the year. Outside financing was unfavorable due to the tight money market.

The author, Roy Bennett, is foreign exploration manager for Sohio Petroleum Co. This article is a condensed version of Bennett's address as outgoing president of the Society of Exploration Geophysicists at its 1957 convention held in Dallas, Tex., U.S.A.

Exploration picture bright . . . The picture has not been so bleak for geophysics and geophysicists. The committee on geophysical activities for the Society of Exploration Geophysicists reports an average of 528 seismic crews operating in the United States during the first 8 months of the year. This compares with 520 at the end of 1956, and a considerable increase in foreign operations is indicated.

The demand for trained geophysicts continues to far outstrip the supply, and this remains one of the major problems of exploration geophysics.

Drilling is, after all, a short-term investment, whereas exploration is an investment in the future. It is heartening that the considerable curtailment of drilling in the United States has not been accompanied by a corresponding decrease in exploration. At a time when the oil industry is faced with reduced earnings, high costs, lower product demands, and stringent proration, management's confidence in the future is clear.

Geophysicists have every reason to share this long-term optimism. Here are some of the predictions of John C. Casper, ecnomics editor, The Oil & Gas Journal, July 29, 1957.

- Total domestic demand in the United States for petroleum liquids will climb 21 per cent to 10,600,000 bbl. daily by 1960. It will reach 13,250,000 bbl. daily by 1965. Natural gas requirements for 1960 will be 13.26 trillion cubic feet and increase to 16.32 trillion for 1965, as compared with 11.0 trillion cubic feet produced in 1956.

- United States domestic production of petroleum liquids will exceed 9,000,000 bbl. daily in 1960 and 10,000,000 by 1963. The daily average will be 10,890,000 bbl. in 1965. Natural-gas production in 1965 will be 15.77 trillion cubic feet. These estimates indicate a production increase of 37 per cent in petroleum liquids and 44 per cent in natural gas over the next 8 years.

- United States drilling in 1956 resulted in 58,160 wells to discover and develop 3.8 billion barrels of petroleum liquids and 24.0 trillion cubic feet of gas or 7.9 billion barrels of crude, condensate, and barrel equivalent of natural gas. Assuming a like success ratio and historic decrease in recoveries per well drilled, 82,300 wells will be required to develop the 9.5 billion barrels needed in 1965.

- United States exploration faces the formidable task of finding 8.1 billion barrels of crude and crude equivalents of natural gas in 1960. In 1965, we must find 9.5 billion barrels. These volumes will be needed to replace production and maintain reserves.

Why gas is included . . . These statistical forecasts include crude oil, condensates, and natural gas. Natural gas has been converted to crude equivalents at the rate of 6,000 cu. ft. per barrel. Exploration for gas is inseparable from crude oil; therefore, results are distorted unless gas production and reserves are included in any analysis. Vastly expanded transmission systems have elevated natural gas to an important position in the family of energy fuels. From these estimates, substantially confirmed by most economists, you can understand management's optimism and confidence in the future of petroleum production.

What do these predictions mean to the exploratory professions? If the predictions are reasonable and present trends continue, the number of exploratory wells required in 1965 for the United States will be over 21,000, or more than 60 per cent above the number now being drilled.

How will these tests be located for the greatest economic return? I am confident that geophysics will play as great or a greater part than it does today. Geophysicists have made great and significant advances in the past 10 years in methods of recording and resolving our data. And this, it seems to me, will inevitably lead to equivalent improvements in interpretation which will enable us to unravel the more complex and more obscure features which industry will test.

One report, more than anything else, gives cause for confidence. This is Dr. Lahee's report that new field wildcats located by geophysical advice had a success ratio of better

than 16 per cent. This compares with a success ratio of 5.5 per cent for wells located without technical advice, and 9.3 per cent for wells located solely on geological advice.

Let's repeat the question: How will the everincreasing number of exploratory wells be located? Results prove that geophysical exploration reduces exploratory-drilling risks by two-thirds. Management in search of production rather than tax writeoffs will make use of this advantage. The cost of peophysical operations in the United States at today's level is $200,000,000 per year. That is about 10 per cent of more than 2 billion dollars that is spent on geology, geophysics, leases, and exploratory drilling. What a bargain!

Bargain or not, however, the future of exploration geophysics will be determined by results yet to be obtained. Industry will continue to measure results by petroleum discovered per dollar expended. That is the American way, and it has provided us with the best way of life in the world today.

I am confident that geophysicists will continue to do a productive job on the oil-finding problem which becomes more complex each day.

Where will our "big" reserves in the United States be found in the future? Will they be in stratigraphic traps, reefs, highly folded and faulted anticlinal structures, or some unknown trapping mechanism? All these conditions are a part of basin building and related deposition. The answers will be found in complete understanding of basin geology. There must be reasons for facies changes, reef growth and trends of structural features. More basic research is required to define the targets for which we search. Exploration geophysics should be a part of this research since it can provide information of the basin architecture from the basement to the earth's surface.

"Where will our 'big' reserves in the United States be found in the future? Will they be in stratigraphic traps, reefs, highly folded and faulted anticlinal structures, or some unknown trapping mechanism? All these conditions are a part of basin building and related deposition."

This is not a routine chore for a "record picker" or a supervisor who thinks only in terms of holes shot per day.

Geology and geophysics . . . Coordination of geological and geophysical information, under extreme pressure the past several years, is a reality. The effectiveness of this partnership will depend on the strength of the partners. Geophysicists must be sure that they bring to that partnership sound, intelligent thinking supported by the latest developments of these professions, then cooperate in the final planning, interpretation, evaluation, and recommendations.

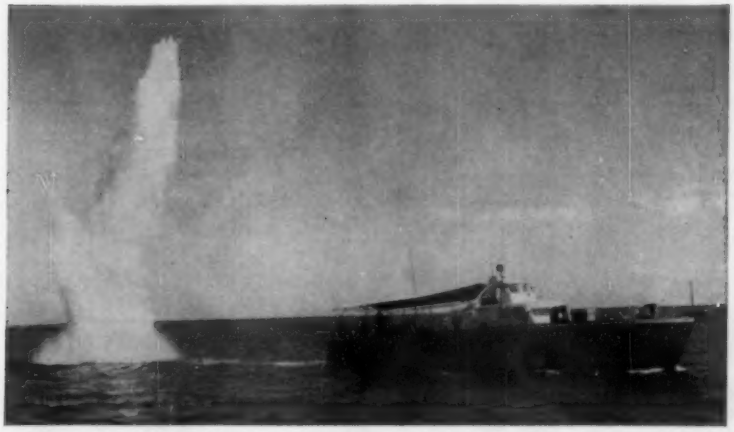
The finest instruments . . . To meet this challenge of the future, geophysicists have the finest instrumentation and equipment ever available. The instrument research laboratories and manufacturers have been making progress in developing tools for improving basic data required as greater complexities are encountered.

Now for the $64,000 question: Can we use the full potential of these tools to more precisely and accurately interpret the refracting and reflecting layers of our earth? This problem faces all geophysical groups today. We must now develop as individuals to properly use the electrical and mechanical marvels of the laboratory.

I have deliberately chosen to speak about exploration geophysics in oil finding within the United States. Nearly 70 per cent of our geophysical operations are located in the United States and Canada. Problems here are multiplied by successful exploration in the past and the fact that one-half of the world oil supply is being produced from one-sixth of the known world reserves.

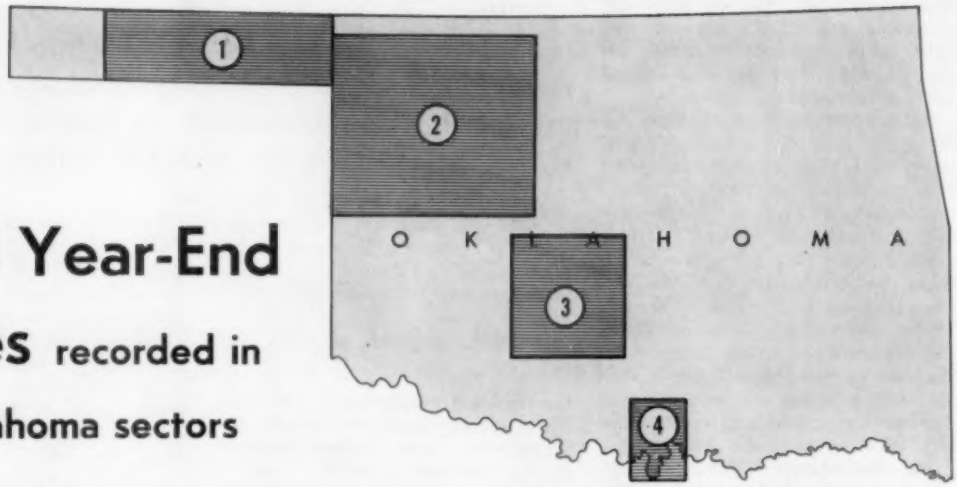
It is axiomatic, however, that each successful wildcat reduced the number of remaining undiscovered oil fields. From this, we might draw the dismal conclusion that if we hunt for oil tomorrow with yesterday's tools, economics will put us out of business long before the last oil field is found. Fortunately, the compounding of experience and research equips us to do the necessarily better job.

We are fortified by this accumulated knowledge. To do the job ahead, however, will take ever-increasing mounds of facts and figures. It takes what it has always taken in this fascinating business: the individual oil finder whose imagination flows from a sound understanding of realities, whose daring and courage are tempered by his experienced judgment, whose faith in his fellow scientist and dedication to a common objective have brought him the knowledge that the ideas and dreams of the individual are brought to fruition only through the coordinated efforts of the organization.



SENSIBLE EXPLORATION work pays off regardless of where it takes place. Whether water-borne, as at left, or following up the slow and costly swamp operation shown at right, the results more than justify the efforts.

Good Year-End Strikes recorded in four Oklahoma sectors



The four sectors outlined in the map above are the scenes of important strikes at year end in Oklahoma. The areas are: 1. Panhandle, 2. Northwest, 3. Southwest, and 4. South.

FOUR SECTORS in the western part of Oklahoma caused the most excitement at year end with important strikes in the Panhandle, Northwest, Southwest and South sectors.

1. Panhandle

Pre-Permian exploratory campaigns in the Oklahoma Panhandle in recent years have reaped good rewards. This year is no exception.

Cities Service Oil Co. 1 Seltzer, NE SW 11-4n-14eCM, is a new inside-Hugoton Morrow discovery, flowing 7,650 M.c.f. per day at 6,167-6,202 ft. This strike is 5 miles west of the 1 Murdock discovery which made 205,000 M.c.f. per day from the Morrow recently, plus 9 bbl. of oil per hour from Morrow sand.

Other busy deep areas in Texas County are the Hardesty and Camrick fields. Recent completions in these two areas have been making as much as 90,000 M.c.f. of gas per day from Morrow sand. Carter Oil Co. 1 Jolliffe-Pauls, NE NE SW 26-3n-18eCM, Northwest Hardesty field well, flowed 54,500 M.c.f. per day, open flow from Morrow.

Panhandle Eastern Pipeline Co. has a new Morrow discovery near East Sturgis field in the northwest part of Texas County. The 1 Reiss, C NW NW 11-5n-10eCM, flowed 2,972 M.c.f. of gas per day on tests of the Morrow.

In Beaver County, the easternmost of the Panhandle counties, Shell Oil Co. 1 Moore, Highland field well, flowed 50,000 M.c.f. of gas per day with 4 bbl. condensate per million to give this area another boost. This has been one of Beaver County's busiest and most successful new fields in recent months.

2. Northwest

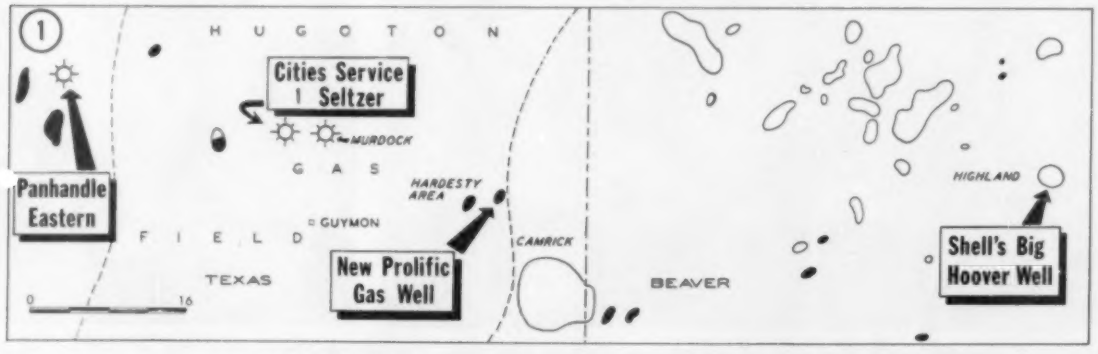
Ellis and Woodward counties lead the discovery race in northwestern Oklahoma. Five new fields have been opened in Woodward County this year, three in Ellis.

Sinclair Oil & Gas Co. has proved a new Woodward County producing area at 1 Phillips, 1½ miles east of the original discovery, which is northeast of the city of Woodward. The well, located in C NW NW 5-23n-19w, flowed 10,000 M.c.f. of gas per day on tests with some condensate from the Morrow-Pennsylvanian at 7,420-42 ft. A test was also made in the Chester-Mississippian.

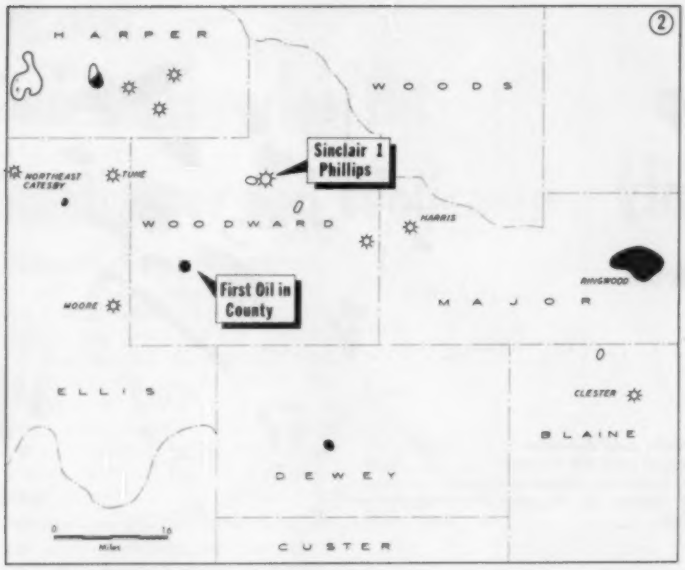
The county also received its first oil production at a Pan American well 7 miles south of Woodward in SE NW 3-21n-21w. The well swabbed 48 bbl. of new oil and 12 bbl. of water in 24 hours on tests at 6,629 ft. Operator is installing pumping equipment.

Pan American Petroleum Corp. recently opened two important gas fields in Ellis County.

The 1 Tune, NW SE 35-24n-23w, is a Morrow discovery, making 16,500 M.c.f. per day. Another discovery, the 1 Moore in 14-21n-23w, 15 miles south of the 1 Tune, flowed 10,800 M.c.f. of gas per day from the Morrow. Both these discoveries are expected to keep Ellis County exploration high in the coming months.



IN PANHANDLE AREA, the pre-Permian excitement continues its climb.



IN NORTHWEST AREA, Woodward and Ellis counties produced eight new fields this year.

Shell Oil Co. has another well at its new Ellis County pool, Northeast Catesby. The 1 White, C NE SW 31-24n-25w, made 9,000 M.c.f. of gas per day and 16.6 bbl. distillate per million on tests of the Morrow sand at 8,142-8,269 ft. This field reopenes Ellis County to production after several years of inactivity.

East of Woodward in Major County, Pan American has another Pennsylvanian discovery 30 miles west of the famous Ringwood field. The 1 Harris, SE NW 13-22n-16w, flowed 14,245 M.c.f. of gas per day from the Cottage Grove. This is the easternmost Pennsylvanian anchor in the growing cluster of fields in northwestern Oklahoma.

Blaine County, which got its first producing area last year at Okeene, has another discovery area. Gulf Oil Corp. and John Coyle 1 Clester, NW NW NW 15-18n-10w, flowed 3,500 M.c.f. of gas per day with 50 bbl. distillate per day from Chester perforations at 7,730-92 ft. This opens the county's second field and promises increased exploratory and development activity.

3. Southwest

East Cement and New Hope occupy top spot in southwestern Oklahoma wildcat news this month.

Pan American 1 Williams, NW NW 1-5n-9w, East Cement area well, is an important new-pay discovery with 8,800 M.c.f. of gas coming from the Springer sand at 14,400-14,509 ft.

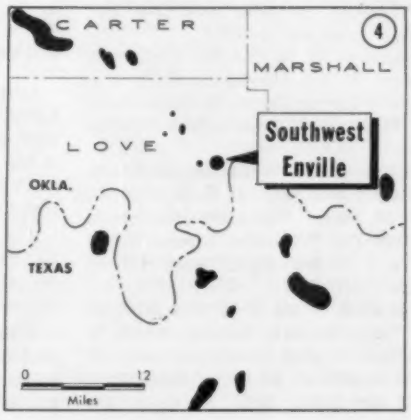
In McClain County, Gulf Oil Corp. 1 Beard, New Hope area wildcat, found about 100 ft. of Ordovician pay at 10,739-10,814 ft. in the first Bromide sand and at 18,854-18,944 ft. in the scond Bromide. Flow was 66 bbl. of oil per hour from the first zone and 40 bbl. per hour from the second with 2,316 M.c.f. of gas. This Ordovician discovery is another in the growing push for production from these deep, thick south Central Oklahoma sands. Ordovician strikes have dominated discovery news in this section of the state for more than 2 years with names like Knox-Deep, Washington, and Enville.

4. South

What appears to be the state's most important new-pay discovery of the year is nearing completion. It is Pasotex Petroleum 1 Brannan in Southwest Enville field, Love County. The Oil Creek discovery flowed 225 bbl. of condensate per day and 3,410 M.c.f. of gas on 14/64-in. choke. Ultimate recovery from the Oil Creek sands in this area is expected to be quite high.

IN SOUTHWEST AREA, East Cement and New Hope fields take the lead in new wildcat discoveries.

IN SOUTH AREA, the Southwest Enville field promises high recovery.



EAST TEXAS

Shell Projects Deep Test in Wood County

Big Chief Will Drill 14,000-Footer

TOP EXPLORATION news for last week included the location of a Smackover wildcat in northwestern Wood County, completion of a Pettet opener in Rusk County, plus a number of other new wildcat starts.

The deep project is Shell Oil Co. 1 Earl Deas, located in the northwest corner of a 76.95-acre tract in E. Esparsa Survey, A-182, or 5 miles southeast of Yantis in Wood County.

Contract depth is 14,000 ft., with Big Chief Drilling Co. scheduled to move in shortly to drill.

Shell is said to have a large block in this area, as does Pure Oil Co. The latter company has an interest in the wildcat.

Deep subsurface control will be furnished by Stanolind Oil & Gas Co. 1 Peveto, a 1955 test drilled to total depth of 11,104 ft., where it stopped in salt. On elevation of 466 ft., 1 Peveto logged the following markers: Sub-Clarksville 3,915 ft., Woodbine 4,352 ft., Goodland 6,135 ft., Paluxy 6,195 ft., and the Cotton Valley at 9,520 ft. It went into a fault at 10,142 ft., and hit salt at 10,300 ft.

Rusk County discovery . . . Trice Production Co. has completed its 1 Grady Hays Unit as a Pettet oil discovery 2 miles southwest of Henderson townsite in western Rusk County.

Completion potential was 58 bbl. of 39°-gravity oil a day through ¼-in. choke, from perforations at 7,232-80 ft. Flowing pressure was 200 psi. Gas-oil ratio was 600:1.

Location is in the H. Cockburn Survey, A-212. Henderson field, 3½ miles to the northeast, produces from the Pettet and Travis Peak formations.

Outcome of a Woodbine wildcat in this same was near, at F. R. Jackson 1 T. M. Paine. Operators expected to be into the Woodbine around 4,000 ft., and at last report were drilling below 3,800 ft.

Location is on a 41-acre tract in the Levy Landers Survey, which is 3½ miles west of Henderson, and 1½ miles northwest of Trice Production Co.'s new Pettet well.

Place-fix map shows location of Shell Oil Co.'s new 14,000-ft. Smackover wildcat in Wood County.

GULF COAST

Queen City Well Gives Texam Field New Pay

Queen City sand is proving productive in Texam field, in southwestern Live Oak County. It is the second pay zone for the field, in which previous production has been from the deeper Wilcox-Slick sand. Three wells have been completed in that sand. All production so far has been gas.

The new production is in Mayfair Minerals' 1 Sanger, a hole drilled in 1956 and abandoned at that time at 7,775 ft. Mayfair cleaned out the hole, ran casing through the Queen City to 5,550 ft., and perforated opposite the indicated pay at 5,478-84 ft.

The well is rated good for 3,100,000 cu. ft. of gas per day. Gas yields 65.9°-gravity condensate in the ratio of 73,230 cu. ft. of gas per barrel of liquid. Shut-in pressure is 2,059 psi.

Dual Gasser Revives Miller Ranch Field

Louis H. Weltman is reviving Miller Ranch field, in San Patricio County, with a dual-pay gas-condensate well at his 1 Miller, completed in a 4,340-ft. Vicksburg sand, and a 2,950-ft. Heterostegina zone.

The well is southeast of two 3,700-ft. Frio oil wells drilled by Lee Brothers in 1951. Neither of these wells is reported on production.

The Vicksburg pay (Kohler zone), perforated at 4,341½-43½ ft., tested for open-flow potential of 6,000,000 cu. ft. of gas per day. The Heterostegina zone is rated good for 8,500,000 cu. ft. per day. Gas is dry. Shut-in pressures are 1,475 psi. and 1,281 psi., respectively.

New Deeper Producer Extends Liberty Field

Production at South Liberty, in Liberty County, is being extended nearly a mile farther northeast with discovery of a new deep Cook Mountain gas-condensate reservoir. The reservoir is the deepest so far proved productive at South Liberty.

Pay, perforated at 11,588-94 ft., is nearly 700 ft. below the previous deepest production. Total depth is 11,721 ft.

The new discovery is by Beck Oil Co. at its 1 Independent School District, about a mile northwest of Liberty townsite. Completion flow was at the rate of 5,600,000 cu. ft. of gas per day with condensate (58°-gravity) recovery in the ratio of 45,000 cu. ft. of gas per barrel of liquid.

EXPLORATION THIS WEEK

Texas	112
Kansas	114
Canada	114
Louisiana	114
Arkansas	114
North Dakota	117
Rocky Mountains	117
Michigan	117
Appalachian	117
California	118
Illinois Basin	118
Mississippi	119
Successful Wildcats	119

WEST TEXAS

Two Discoveries Hit Ellenburger and Wolfcamp

EXPLORATORY drilling has added two pool discoveries on the southeastern end of Central basin platform. Locations are shown on the place-fix map. Sinclair Oil & Gas Co. and Atlantic Refining Co. drilled the Ellenburger well south of Rankin in Upton County, while Texas Crude Oil Co. completed the Wolfcamp gas discovery east of Fort Stockton in Pecos County.

Sinclair and Atlantic own equal interest in the 160-acre tract on which their 1 Ella Corbett estate was completed as an Ellenburger discovery. Final potential was 192 bbl. of 43°-gravity oil a day through ½-in. choke, from perforations at 10,502-10 ft. Gas-oil ratio was 225:1.

The Wolfcamp gas discovery was completed by Texas Crude Oil Co. for a calculated daily potential of 14,200 M.c.f. of gas. The well is 1-11 Gulf-University, 2 miles west of Wolfcamp oil production in Putnam field, and 10 miles south of Girvin townsite. Location is Section 11, Block 20, University Lands Survey.

Pecos County new pay . . . Ellenburger pay has been added to the western portion of East Abell field at George T. Abell 2 Keith Heagy, 1 mile southeast of Imperial.

Ellenburger potential was 145 bbl. of 41°-gravity oil a day, through 17/64-in. choke, from perforations at 6,227-42 ft. Gas-oil ratio was 239:1. Tubing pressure was 75 psi., with casing packed off.

Location is 990 ft. from northwest and 330 ft. from northeast lines of Section 9, Block 3, H&TC Survey. Nearby deep production in East Abell multipay field produces from the Waddell and McKee sands of Upper Ordovician age. Operators of 2 Heagy plan to dually complete their discovery from the McKee.

Sheffield Channel tests . . . Three deep wells in this area of Pecos County, all drilled by Phillips Petroleum Co., were actively drilling last week. Contract depths range from 18,000-22,000 ft.

Phillips 1-A Montgomery, 13 miles southeast of Fort Stockton, was drilling below 12,889 ft. at last report. At total depth 10,122 ft., the well kicked out mud. A drill-stem test at 10,109-10,212 ft., in the Wolfcamp section, flowed gas at the rate of 2,045 M.c.f. per day, under flowing pressures ranging from 1,540-1,900 psi. Shut-in pressure in 18 minutes was 4,850 psi.

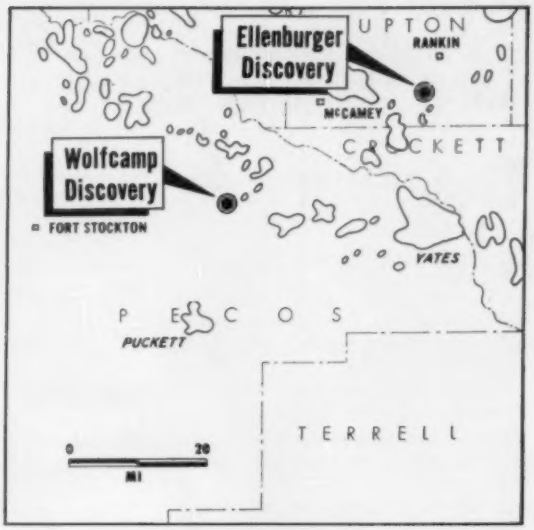
A Great Western Drilling Co. rig is on the job, and projected depth is 22,000 ft.

Phillips 1 "EE" University, 12 miles east of Fort Stockton, was drilling sand and shale at 20,581 ft. last week. Contract depth was originally planned for 18,500 ft.

Several tests in the middle to lower Permian sections have made small gas flows, plus a 20-bbl. recovery of 52°-gravity distillate between 8,118-8,348 ft. Gas-cut water blanket has been recovered on drill-stem tests in the Ellenburger.

Deep formation markers reported were the Devonian at 13,194 ft., and the Ellenburger at 16,708 ft.

Phillips 1-A Harral, 15 miles southeast of Fort Stockton, was below 12,965 ft. at last report. Tentative top on the Wolfcamp was 8,138 ft. A drill-stem test at 12,474-12,599 ft. unloaded gas-cut water blanket but did not flow gas. Projected depth was 18,000 ft.



Ellenburger oil, and Wolfcamp gas discoveries, on Central basin platform of southern West Texas.

Wolfcamp Pay Added To Deep Rock Field

The Deep Rock field in central Andrews County gained its third pay zone at Cities Service Oil Co. 1-BC University, 4½ miles northwest of Andrews, in Section 8, Block 14.

Pumping potential from the new zone was 144 bbl. of 38°-gravity oil a day, with gas-oil ratio of 532:1. Wolfcamp perforations were between 8,600-26 ft. Top of pay was 8,583 ft. The well was a dual completion, having been completed earlier from the Ellenburger below 12,000 ft. Previous pays in the field have been in the Ellenburger and the Glorieta.

In southern Andrews County the Emma field got a dual producer, from the Fusselman and the Ellenburger, extending the former production nearly 2 miles to the northeast. The well is Gulf Oil Corp. 1-UT-FK State, 13 miles southwest of Andrews in Section 30, Block 9. Potential on the Fusselman was 293 bbl. of 45°-gravity oil a day through 20/64-in. choke, from perforations at 11,502-54 ft. Gas-oil ratio was 584:1.

Ellenburger potential, which is the regular pay in that area, was 504 bbl. a day from pay at 12,309 ft.

Spraberry Flows Oil In Northwestern Borden

El Paso Natural Gas Co. 1 Lamb, in northwestern Borden County, has been completed as a flowing Spraberry discovery. Daily potential was 246 bbl. of 36°-gravity oil through 16/64-in. choke.

No. 1 Lamb was an Ellenburger project, logging that formation at 9,750 ft. on ground elevation of 2,936 ft. Operators drilled to 9,800 ft., before plugging back to complete in the lower Permian pay. Other markers called included the Spraberry at 6,250 ft., lower Spraberry at 6,849 ft., Canyon reef 8,645 ft., Strawn 8,860 ft., and the Devonian at 9,670 ft.

Perforations in the Spraberry at 1 Lamb were between 6,362-76 ft. Flowing pressures and gas-oil ratio were not reported. Completion was made

following 1,000 gal. acid treatment, and a 20,000-lb. fracture treatment.

Location of the discovery is NW SW Section 25, Block 32, T6N, EL& RR Survey, 16 miles northwest of the town of Gail.

SOUTHWEST

Zavala County Wildcat Opens New Olmos Field

Completion of a rank wildcat gas well 4 miles southwest of Batesville, in northeastern Zavala County, is reported by W. H. McGarr.

McGarr's discovery well, 1 Bartlett, in the Patrick C. Jack Survey, is productive from Olmos sand, perforated at 2,688-74 ft. Its open-flow potential is placed at 2,600,000 cu. ft. of gas per day. Its shut-in pressure is 1,150 ft.

During potential tests, the well flowed at rates ranging from 426,000 cu. ft. daily, through ⅛-in. choke.

Nearest production of any kind has been a short-lived oil well, 12 miles northeast, drilled by Wilcox Oil & Gas Co. in 1937. It was designated as Batesville field, in which no other commercial production has been found.

Several small, shallow oil-productive areas have been found along a trend about 20 miles northwest, and in the southeastern corner of the county there is some small gas production. Except for this there has been relatively little exploration in the county.

NORTH TEXAS

Mississippian Discovery Completed in Young

Anderson Petroleum Corp. 1 N. D. Stovall "A," west-central Young County wildcat, is a new Mississippian discovery in North Texas.

The well flowed 165 bbl. of oil per day, 43° gravity, from open hole at 4,509-20 ft. on 10/64-in. choke. Location of this new field is 4½ miles southwest of Newcastle.

Fry Discovery Finaled In Taylor County

Robinson-Puckett and Boles & Grimes 2 J. E. Smith, south-central Taylor County, 4½ miles west of Bradshaw was completed as a Fry sand discovery

The well flowed 433 bbl. of oil per day on ½-in. choke from perforations at 4,200-07 ft. Location is 2 miles southast of Sanrob Gardner and Fry field in the W. F. Spearks Survey 509.

TEXAS PANHANDLE

Morrow Strike Gaged In Roberts County

Pan American Petroleum Corp. 2 Lips Ranch "B," northwestern Roberts County wildcat, is a new Morrow-Pennsylvanian gas discovery 16 miles southeast of the town of Spearman.

The well was completed flowing an estimated 640 M.c.f. of gas per day from perforations at 8,713-23 and 8,730-41 ft. Location is in Section 161, Block C, G&M Survey.

KANSAS

Mississippian Oil Tested At Sumner County Well

Northern Sumner County, southern Kansas, apparently has a new Mississippian discovery at Breadmore Drilling Co. 1 Nyberg in NE NE NE 13-31s-2w.

The well is 1½ miles southeast of Anson pool. Recovery was 60 ft. of oil and gas-cut mud and 60 ft. of heavily oil and gas-cut mud on test at 3,717-23 ft. Another test at 3,720-33 ft. got 90 ft. of oil and gas-cut mud. A test at 3,730-43 ft. recovered 60 ft. of oil and gas-cut mud, 120 ft. of heavily oil and gas-cut mud, 100 ft. muddy oil, and 20 ft. of water.

New Pool Opened In Barton County

Petroleum, Inc., has a Lansing oil discovery 1 mile north of Phillips field in Barton County, NW SW NE 1-16s-13w. A drill-stem test at 3,063-3,125 ft. recovered 3,027 ft. of clean gassy oil. Location is 12 miles north of the town of Hoisington.

Nadel & Gussman 1 Haas, SW SW NW 6-19s-10w, ½ mile northeast of Rick pool in Rice County is going on pump. The well got 4 bbl. of Arbuckle oil per hour at 3,342-47 ft. Location is 6 miles northeast of Ellinwood.

CANADA

ALBERTA

Wildcat Staked in Clear Hills Area of Northwest

A wildcat is slated for the Clear Hills region in northwestern Alberta, 90 miles northwest of Peace River and 60 miles northeast of Dawson Creek. Shell Oil Co. of Canada, Ltd., will drill the 6-24-88-11 Clear Hills on LSD 6, 24-88-11w6. The wildcat will be a Mississippian stratigraphic test.

Another Field Well Hits At Prolific Innisfail

The prolific Innisfail field, 60 miles north of Calgary, gained another excellent well last week. Canadian Oil Companies, Ltd., found the D3 reef at its 9-9 Innisfail on LSD 9, 9-35-1w5, ½ mile south of the 1-16 discovery well at Innisfail. The drill tapped 143 ft. of oil pay.

Innisfail, discovered last summer, is the fastest growing new field in western Canada. There are 12 producers currently with several more drilling and planned. The new field is considered one of the most important wildcat happenings in western Canada this year.

LOUISIANA

NORTH

Tuscaloosa Produces In Locust Ridge Outpost

Lower Tuscaloosa production at Locust Ridge, in Tensas Parish, is being extended 1½ miles west by a new Adams sand well completed by Rimrock Tidelands, Inc., as operator, with Atlantic Refining Co., Don D. Montgomery, and Raphael Pummpelly holding operating interests.

The extension well, 1 Hopkins, in 26-10n-11e, flowed at the rate of 1,000,000 cu. ft. of gas daily, recovering 51°-gravity condensate at the rate of 115 bbl. per day. Flow was through 5/32-in. choke under pressure of 2,350 psi. Pay is perforated at 9,032-40 ft. Hole was drilled to 9,124 ft.

ARKANSAS

Jerusalem Gas Area Gets New Dual-Zone Producer

Carter Oil Co. has completed another good duel-zone gas well in the Jerusalem area, Conway County. It is the company's fourth well in the area, the farthest east on the northern side of the Northwest Arkansas basin.

The new well, 1 Ramsey, in 32-9n-17w, is perforated at 1,886-1,912 ft. in the field's Atoka-Barton sand, and at 1,261-68 ft. in its Atoka-Allen sand. The deeper pay is good for 11,330,000 cu. ft. of gas per day. The upper pay produced at the rate of 2,200,000 cu. ft. daily.

The field was discovered in February with gas production from the Barton sand. The shallower zone was opened last March.

MADONNA AND CHILD by Bartolome Esteban Murillo
Reproduced by courtesy of The Metropolitan Museum of Art

"And the child grew . . . and the grace of God was upon him."—LUKE 2:40

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NORTH DAKOTA

State Depth Records Fall

Depth records in North Dakota are falling thick and fast with the completion of three deep wildcats in Beaver Lodge field, Williams County last week.

Amerada Petroleum Corp. completed the 1 Herfindahl-Kvam, NW SE NE 26-156n-96w, flowing 465 bbl. of oil and 16 bbl. of water from the Devonian and 182 bbl. of condensate and 7 bbl. of water per day from the Silurian. The Silurian perforations were at 11,714-44 ft., setting a new producing-depth record for the state.

Amerada also completed 1 Iverson-Nelson in NW SE NE 2-155n-96w, flowing 351 bbl. of oil and 29 bbl. of water per day from the Devonian and 162 bbl. of condensate and 45 bbl. of water from the Silurian through perforations at 11,526-11,696 ft. in the Silurian. The Devonian perforations were at 10,145-10,460 ft.

The 1-A Iverson-Nelson, SE NW SW 1-155n-96w, was completed flowing 394 bbl. of oil and 13 bbl. of water daily from the Devonian and 160 bbl. of condensate and 18 bbl. of water per day from the Silurian. The deep Silurian perforations were at 11,499-11,568 ft. and 11,595-11,662 ft.

Casing Set at New McKenzie Discovery

Amerada has an apparent discovery at its 1 Kennedy, C NW NE 29-151n-96w, McKenzie County. The well, 3 miles north of Fancy Buttes field and 4½ miles west of Blue Buttes field, recovered 36½ bbl. of oil on a drill-stem test in the Madison at 9,238-98 ft.

The indicated pool-opener is west of the main portion of the Nesson anticline in an area of no previous drilling, that is between Fancy Buttes and the well itself. There are dry holes northeast and southeast between the well and Blue Buttes.

ROCKY MOUNTAINS

WYOMING

More Gas Found at Desert Springs Well

El Paso Natural Gas Co. recovered about 1,000 M.c.f. of gas per day on test at about 5,900 ft. at the 1 Desert Springs wildcat in N½ SE 26-21n-98w, Sweetwater County.

The rank wildcat tested in what is reported to be the Mesaverde. The same well last week got gas at the daily rate of 5,620 M.c.f. per day in the Lewis at 5,182-5,217 ft.

Second Table Rock Oil Producer Completed

The second oil producer in Table Rock field, Sweetwater County, was completed by The Texas Co. The 11 Government, SE NW NW 30-19n-97w, pumped 43 bbl. of oil and 15 bbl. of water per day from Almond (Mesaverde) at 6,468-6,518 ft. The first oil well, 2 Table Rock Unit, pumped 125 bbl. of oil and 26 bbl. water per day from the same Cretaceous pay. Former production in the field was gas from Wasatch and Almond.

MONTANA

Gas Discovery Reported In Stillwater County

Holland-American Petroleum Co. 1 Castle is a new gas discovery for Stillwater County. The well, located in C NW SE 22-2n-21e, flowed gas at the rate of 20,000-25,000 M.c.f. per day, reportedly. Location is 6 miles north of Lake Basin field.

MICHIGAN

New Alpena Field Indicated in Isabella

McClure Oil Co. and C. W. Collin 1 Lurwig, SE NE SW 32-13n-5w, Freemont Township, Isabella County, averaged 31 bbl. oil day in head flows from Alpena Traverse lime to indicate new oil pool 3 miles northwest of Edmore-Home field in Montcalm County. Wildcat, drilled on Socony-Mobil farmout, logged Traverse formation at 2,990 Alpena at 3,041 ft. and pay from 3,058-66 ft., total depth. Well carried 1,600 ft. oil natural and was averaging 31 bbl. day after 500 gal. acid treatment.

Sun Oil Co. and Superior Oil Co. 1 Stites, SE SE NE 13-21n-10w, Wexford County, completed for 1,700,000 cu. ft. gas in Michigan Stray sand at 1,291-1,340 ft. for new gas pool discovery. Completion was after plug-back from 4,080 ft., with lower zones dry.

APPALACHIAN

OHIO

Flint Ridge Extended To West by Oiler

The production area of Flint Ridge field was expanded to the west with a 320-bbl. producer on 4 (5) John Spencer, Lot 3, Section 8, Hopewell Township, Licking County. The operator, Clinton Oil & Gas Co., reported the Clinton sand at 2,937-3,002 ft. with 15 bbl. natural.

Another Well Completed Inside Dry Area

Another well, among dry holes in the south part of Reading Township, Perry County, was completed on the 1 Jacob Elder, Section 30, by Kinsell Oil Co. Clinton at 2,892-2,918 ft. made a fair showing natural and 65 bbl. in a 24-hour test after fracture.

Oil Show Logged At Ashtabula Offset

Benedum-Trees' first offset to their 1 Scribner, the 1 Henry Fox, Section 26, Monroe Township, Ashtabula County, logged Clinton sand at 3,239-3,402 ft. with a light show of oil at 3,286-97 ft. where pipe will be perforated and fractured. The 1 Scribner is reported as making 50 bbl. per day at this time.

WEST VIRGINIA

Big Gas Discovery Finaled In Pocahontas County

In Green Bank district, Pocahontas County, West Virginia, Columbian Carbon Co. 1-1265 U.S.A. Dept. of Interior rank wildcat elevation 3,394 ft., had the largest successful results of any well after fracturing. Before fracturing the well tested only 88,000 cu. ft. gas. After fracture it had an open flow of 25,500,000 cu. ft. The chert was 5,550-5,690 ft., Oriskany sand 5,718-5,915 ft. Numerous gas pays were encountered from 5,720 ft. down. Total depth was 6,254 ft.

CALIFORNIA

Remote Mojave Desert Is Slated for Exploration

If announced spudding plans materialize, some of the remotest areas of California's Mojave Desert are slated to be tested soon.

Flamingo Oil Co. has staked a wildcat location in 18-10n-21e, which is about 11 miles northwest of the desert town of Needles in San Bernardino County on the California-Arizona border. No spud date has been set, but L. H. Scott has been announced as the drilling contractor.

Virtually in the middle of the Mojave Desert, Joshua Hills of California Oil & Petroleum Co. had moved in equipment and was preparing to spud in a test in SW NW 16-32s-44e. This is about 25 miles northwest of Barstow in San Bernardino County.

In another unique California desert wildcat, Cedric E. Brown Gas & Oil Co. was deepening 2 Well, a 2,200 ft. test on which the operator has had a rig and crew working since October 3, 1956. This strange wildcat is in SE NW 5-7n-11w, about 5 miles east of Lancaster in the upper Mojave Desert portion of Los Angeles County.

Another extra wild, wildcat in the state is being redrilled by Kent Imperial Corp. outside the small Imperial Valley town of Calipatria near the Salton Sea and about 35 miles north of the Mexican border in Imperial County. Kent took this test, 1 Sinclair, to 4,550 ft., plugged it back to 800 ft. and is now redrilling below 2,135 ft.

All except Brown's wildcat at Lancaster are at least 150 miles from any oil production. The Lancaster test is about 50 miles east of the Newhall producing area in Los Angeles County.

Franco Western Taps New Sand at Vallecitos

Franco Western Oil Co. gave the Vallecitos field in San Benito County a new pay sand. Franco reported it had tested 17-28 Ashurst ¾-mile north of the nearest producer for 275 bbl. daily of 35°-gravity crude through a 14/64-in. choke and 500 bbl. daily through a 20/64-in. choke. The producing interval, a new one for the area, is in the Eocene age Yokut at 2,930-3,048 ft.

The operator had staked a north and south offset location while Shell Oil Co. reportedly was getting ready to spud in a westerly offset on its own acreage. The Franco discovery is on the west edge of its 1,800 acre holdings in 16s-11e.

Humble Quits Deep Yolo County Test

Humble Oil & Refining Co. has thrown in the towel after 14 months on a 15,298 ft. wildcat in the Rumsey Hill area of Yolo County in northern California. This well came within 1 ft. of the Sacramento and northern California drilling depth record now held by General Petroleum Corp. with its abandoned 15,299 ft. 65-10 Glide Court in the Saxon area of Yolo County. Humble ran a series of tests on the wildcat, 1 Mary A. Tippetts, before abandoning it. Humble had a "no dope" tag on it throughout the drilling but there were rumors of good shows several months ago which apparently failed to materialize.

Trico Gives Trico Gas Field Good Completion

Trico Oil & Gas Co. completed a good "B" zone gas well on its holdings on the southeastern flank of Trico gas field in Tulare County. The well, 6 Tulare Farms, was drilled to 3,275 ft. total depth and plugged back to 2,526 ft. for completion. Trico gun perforated the Mya zone at 2,478-82 ft. and 2,482-84 ft., but it tested wet, recoverying 1,260 ft. of salt water. A production packer was set at 2,460 ft. and the well brought in flowing 3,400 M.c.f. daily, no water, through a 30/64-in. choke from the "B" zone at 2,478-82 ft., 2,476-79 ft. and 2,482-84 ft.

West Bellevue Extended

Superior Oil Co. moved northwest ½-mile from the nearest West Bellevue field producer in Kern County and completed a 8,051 ft. test making 184 bbl. daily of 25°-gravity crude, 50 per cent cut, from an interval at 7,824-29 ft. Superior took over this well as operator from F. M. Taylor. It is located in NE NE 32-29s-26e.

Movie Lot Well to Get Second Redrill

Universal Consolidated Oil Co. has plugged back 2A Community on its 20th Century Fox movie lot location for a second redrill. The hole was originally taken to 8,494 ft., plugged back to 5,269 ft. and redrilled to 7,555 ft. It has now been plugged back again, this time to 5,223 ft. and the operator was preparing to try again. This well is being drilled from the newest sound-proofed drillsite located about 1,000 ft. north of the original soundproofed site where the operator was drilling below 2,152 ft. on No. 16 20th Century Fox.

ILLINOIS BASIN

ILLINOIS

Three New Oil Pools in Illinois in November

Three new pools, New Douglas South in Bond County, Gila in Jasper County, and New Memphis East in Washington, were discovered in Illinois in November. Only one producing well has thus far been completed in each of the three pools.

There were extensions to seven pools: Blackland in Christian County, Oskaloosa in Clay County, Omaha East in Gallatin County, Clay City Consolidated in Jasper County, Ina in Jefferson County, Harrison in Macon County, and Raleigh South in Saline County.

Three new pays in pools were discovered in November, the McClosky limestone in Oskaloosa pool in Clay County, the Cypress sandstone in Omaha East pool in Gallatin County, and the Rosiclare sandstone in Ina pool in Jefferson County.

The estimated production for November is 6,886,000 bbl. as compared with an estimated 7,193,000 bbl. in October and 6,620,000 bbl. in November 1956.

EASTERN KENTUCKY

Shop Branch Area Well Completed in Pike

On Shop Branch of Elkhorn Creek in Pike County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. has completed 6393 Floyd Anderson. The well tested initially at the rate of 30 bbl. of oil daily along with 100,000 cu. ft. of gas, pay being the Mississippian Big lime 3,060-80 ft. Total depth was 3,086 ft. and well was completed naturally.

MISSISSIPPI

Second Valley Park Well Makes Rodessa Pumper

Amerada Petroleum Corp.'s second well in Valley Park field, on the Sharkey-Issaquena county line, has been completed on the pump making 59 bbl. of 13°-gravity oil in 24 hours. No water is indicated.

The well, I U.S.A.-Vaughey, is productive from Lower Cretaceous-Rodessa sand, perforated at 6,136-48 ft. It is a half mile north of the same operator's discovery well, completed in November 1956 with production from the Mooringsport zone at 6,264-72 ft. The latter well is not on production now.

Started last June, the new well was drilled to 12,665 ft. Bottom is in salt, topped at 12,421 ft. It has not been determined whether this is bedded salt or a dome. Hole was drilled to that depth with Smackover lime as the objective, but failed to find that formation. It encountered a sizable fault at 5,990 ft., just above the Ferry Lake anhydrite.

Valley Park is the most northwesterly of Mississippi's fields in which Lower Cretaceous sands have proved productive. Nearest Lower Cretaceous field is Bolton, 35 miles southeast, in Hinds County.

Training tomorrow's oil finders is a more serious subject than would appear from the smiling expressions on the faces of these men who are engaged in discussing the problem. Dr. John W. Vanderwilt, president of the Colorado School of Mines, left, here makes a point to Gerald H. Westby, president of Seismograph Service Corp., Tulsa, A. J. Hintze, exploration manager, Phillips Petroleum Co., Bartlesville, and Ben F. Rummerfield, vice president, Century Geophysical Co., Tulsa. Dr. Vanderwilt is currently making a tour through the oil industry to acquaint oil leaders with the problems facing colleges today in training scientists and engineers. "Industry support of the nation's colleges will permit colleges to turn out better scientists, engineers, and geologists," Dr. Vanderwilt stated. "This financial support will mean that colleges and universities can expand to meet the requirements thrust upon them by the rapidly expanding oil industry."

Successful Wildcats

CALIFORNIA

Sacramento County: The Texas Co. 2 Georgiana Unit-2, NW SE 3-4n-4e, IPF 1,300 M.c.f. gas, 12/64-in. choke, 1,400 psi. T.P., perfs. 4,070-82 ft., TD 4,144 ft. (New Midland sand discovery in Georgiana Slough field.)

SOUTH LOUISIANA

Iberia Parish: Ocean Drilling & Exploration Co. 1 Williams, Inc., 3-12s-10e (1½ miles northwest of Little Bayou Pigeon field). IP 3,320 M.c.f. daily and 63 BOPD, $\frac{7}{16}$-in., 49°, TP 4,200 psi., perf. 12,200-12 ft. TD 12,428 ft. (Extends Little Bayou Pigeon field.)

LOUISIANA OFFSHORE

Plaquemines Parish: Humble Oil & Refining Co. 2-A Humble-Gulf-State Lease 192, Block 24, West Delta area, Gulf of Mexico. Shut-in gas well, no gage. TD 14,150 ft. (New field—well standing with casing cemented but not perforated.)

Terrebonne Parish: Pan American Petroleum Corp. 2 State Lease 758, Block 39, Ship Shoal area, Gulf of Mexico. IP 4,150 M.c.f. daily and 46 BOPD (net —30 per cent b.s. and w.), $\frac{7}{16}$-in., 46.7°, perfs. 16,828-42 ft. TD 18,002 ft. (New field—off east flank of Coon Point dome.)

MICHIGAN

Wexford County: Sun Oil Co. and Superior Oil Co. 1 Stites, SE SE NE 13-21n-10w, 14 miles west Riverside gas field. IP 1,700,000 cu. ft. gas. Elev. 1,355, Brown lime 1,188 ft., Michigan Stray 1,324 ft., pay 1,291-1,340 ft.; Traverse lime 3,210 ft., Dundee dolomite 3,844, TD 4,080 ft.; plugback to 1,365 ft. (New gas pool.)

SOUTHWEST TEXAS

Hidalgo County: Mayfair Minerals, Inc., 1 Houts-Kotzur, Tract 93, Valley Farms Subd., Santa Anita Grant (5 miles east of McCook). IP 580 M.c.f. daily, absolute open-flow potential, GLR 600 M.c.f. per barrel, shut-in tubing pressure 2,293 psi., perfs. 7,535-41 ft. TD 8,802 ft. (New pay in Monte Christo field.)

Jim Hogg County: Joseph S. Morris et al 2 Mestena, Sec. 34, Fowler & Rankin Subd., El Sordo Grant, A-326. IP 15,250 M.c.f. daily, absolute open-flow potential, dry gas, perfs. 3,588-92 ft. (Lower Government Wells) and 10,500 M.c.f. daily, aboslute open-flow potential, dry gas, perfs. 3,474-80 ft. (Upper Government Wells). TD 4,250 ft. (New pays in San Pablo field.)

TEXAS GULF COAST

Calhoun County: Edwin L. Cox, C. G. Glasscock, and Tidelands Oil Co. 1 State Tract 81, Kellers Bay (3 miles south of Olivia). IP 22,500 M.c.f. daily, absolute open-flow potential, GLR 55.6 M.c.f. per barrel, 54.9°, shut-in pressure 3,073 psi., perfs. 8,590-98 ft. (Frio-Melbourne), and (dual completion) 9,200 M.c.f. daily, GLR 29.7 M.c.f. per barrel, 55.1°, shut-in pressure 3,337 psi., perfs. 8,432-40 ft. (Frio). TD 9,042 ft. (New field.)

Chambers County: Meredith & Co., et al 1 Tyrrell-Dubois, Sec. 107, HT&B Sur., A-153. IP 21,500 M.c.f. daiy, absolute open-flow potential, GLR 73 M.c.f. per barrel, 59°, shut-in pressure 2,940 psi., perfs. 8,232-37 ft. (Frio). TD 8,564 ft. (New field.)

Nueces County: Gilcrease Oil Co. 1-A Sanders, Sec. 165 BS&F Sur., IPP 86.78 BOPD (net), 60 per cent water, 23.6°, perfs. 4,208½-10½ ft. (Catahoula). TD 4,211 ft. (New pay in Baldwin field.)

Polk County: Oil Reserves Corp. 2-K Kirby-Stephenson, James Stephenson, Sur., A-523. IP 89,000 M.c.f. daily, absolute open-flow potential, GLR 46.6 M.c.f. per barrel, 61°, shut-in pressure 2,392 psi., perfs. 6,550-53 ft. TD 6,900 ft. (Second well and new pay in Menark Creek field.)

San Patricio County: The Texas Co. 1 K. C. Carmody Estate, Sec. 21, J. McKee Third Addition, Taft Farm Lands. A-189. IP 800 M.c.f. per day, ¼-in., 10 BC per M.M.c.f., TP 2,150 psi., perforations 6,300-03 ft. (Frio). TD 6,380 ft. (New pay in East Taft field.)

WEST VIRGINIA

Pocahontas County, Green Bank district: Columbian Carbon Co. 1-1265 U.S.A. Dept. of Int., elevation 3,394 ft., 25,500,000 cu. ft. gas after fracture (before fracture 88,000 cu. ft.), chert 5,550-5,690 ft., Oriskany sand 5,718-5,915 ft., gas 5,720 ft. TD 6,254 ft.

Norman F. Blundell

Pipeliner Likes Automation

. . . and foresees new era of central pipeline control for industry. Gulf Interstate's new vice president played big role in company's successful experiment.

THE TREND toward automation has just started in the pipeline industry.

That's the opinion of Norman F. Blundell, chief engineer of Gulf Interstate Gas Co., which has spearheaded the use of fu ly automatic compressor stations.

"I feel that any new pipeline that will be built in the future will be—and should be—fully automatic," says Blundell, who recently was promoted to vice president of the company.

Approximately half of Gulf Interstate's compressor horsepower is now fully automatic, with the remainder being semiautomatic.

Under Blundell's direction, the company installed automatic controls at its Stanton, Ky., station and operated it by remote control for 8 months as an experiment.

The operation proved so successful that the company installed automatic controls at its four new compressor stations. When the installations are complete, in about 2 months, all five stations will be operated from a central control panel at Nashville, Tenn.

Early life . . . Blundell was born at Sparks, Nev., June 19, 1910. After finishing high school there he attended the University of Nevada at Reno. He was graduated with a bachelor's degree in civil engineering in 1932.

He worked briefly for his father in the retail business and later was employed by the Department of Interior. In 1935, a college friend from Michigan sent him a telegram telling of a job opportunity in the oil business there.

"I'd never been east of the Rockies," recalls Blundell, "and I thought I'd go and see what it was like."

He got a job as an engineer with the old Michigan-Toledo Pipeline Co., then a subsidiary of Standard Oil Co. of Ohio. Blundell helped with the construction of a pipeline to move Michigan crude oil to Standard's refinery at Toledo.

By 1941 he had become chief engineer and superintendent of operations for Michigan-Toledo. While in Michigan he also acquired a dependent, a Missouri girl named Jean Elizabeth Crome, now the mother of his two daughters, aged 6 and 16.

Blundell worked briefly for Dow Chemical Co. at Ludington, Mich., in 1942-43. By then he had been pegged, largely by chance, as a confirmed pipeliner. Even with Dow, he found himself in the pipeline business—as engineer on a brine gathering system.

Job-hopping . . . Starting in 1943

Personals

W. B. Neidert has been appointed superintendent of operations at Texas Gas Corp.'s Winnie, Tex., natural-gasoline plant. Neidert was formerly assistant superintendent at Phillips Petroleum Co.'s San Roque, Venezuela, refinery.

Z. C. Ambrose, has advanced from assistant president to president of Associated Oil & Gas Co., Houston. He succeeds **H. J. Mosser,** who has moved up to chairman of the board. **D. C. Bintliff,** executive vice president, has been named vice chairman of the board. Ambrose, Mosser, Bintliff, **J. G. Taylor** and **A. W. George** have been named members of the executive committee. Ambrose joined Associated in 1954. He was formerly vice president of Southwest Gas Producing Co., and Carbons Consolidated, Inc., and president of Monla Gas Co., Inc. He was a director of these companies and the parent company, Commonwealth Gas Corp.

M. W. Goering, Casper, Wyo., district geologist for Amerada Petroleum Corp., has been transferred to Tulsa as supervisor of Rocky Mountain region operations. **Mike Johnson,** staff geologist, moves up to succeed Goering at Casper. At Amerada's Bismarck, N. D., office, **K. W. Roth,** district geologist, has been transferred to Denver in the same capacity. **H. L. Hurley,** Denver district geologist, will replace Roth in Bismarck.

Thomas B. Burns, Denver geological consultant, has joined Dawson Oil Corp. in Denver as staff geologist. Burns was with Rocket Drilling Co. before opening consulting offices earlier this year.

D. F. (Frank) Garrett, Midland, Tex., executive vice president of Cactus Drilling Corp. of Texas, San Angelo, has resigned to become a full-time independent operator. Garrett, who has substantial oil interests, joined Cactus when it was organized in 1948

Blundell, like many others in the booming pipeline business, moved rapidly from one project to the next. Every time he left a company he left behind him a new pipeline.

First step was with Panhandle Eastern Pipe Line Co. He became resident engineer at Kansas City and later was put in charge of design and construction of compressors on the company's new gas line out of the Texas and Oklahoma panhandles. He also was in charge of gathering lines for Hugoton Production Co.'s new system.

In 1950 Blundell was transferred to Trunkline Gas Co., newly formed subsidiary of Panhandle Eastern. As assistant chief engineer, he helped build Trunkline's system from the Rio Grande Valley to Illinois.

After completion of the Trunkline system, Blundell helped form the nucleus of Gulf Interstate in 1953. He was one of about eight technical men who had left Panhandle Eastern to join Trunkline. Most of the same men later transferred to Gulf Interstate to design and build its line from South Louisiana to West Virginia.

Expansion . . . Blundell and his associates have had few breathing spells with Gulf Interstate.

The company's system, with an original capacity of about 375,000,000 cu. ft. per day, has been undergoing almost constant expansion in the past 3 years. New facilities which went into service in November boosted capacity to 585,000,000 cu. ft. Plans now call for a looping program to increase capacity to 666,000,000 cu. ft. daily.

If available gas keeps pace with market demand, Blundell expects the expansion program to continue for years into the future.

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with one rig. The firm now has nine rotaries in the Permian basin and a Canadian affiliate has four more.

R. B. Gustafson, Jr., district geologist and exploration superintendent for Delhi-Taylor Oil Corp. in Lafayette, La., has been transferred to Dallas as senior staff geologist of operations.

D. P. McDonald, vice president of Westcoast Transmission Co., Ltd., has been appointed managing director. A graduate of the University of Alberta, McDonald joined Westcoast in 1949. He was counsel for the Royal Commission on Natural Gas in Alberta before that time.

Charles R. Hetherington has been appointed managing director of Pacific Petroleums, Ltd. Hetherington has been with Pacific since 1952. Before that time he was with Ford, Bacon & Davis, Inc., where he directed design of Westcoast Transmission Co.'s British Columbia gas line. Hetherington is a graduate of the University of Oklahoma and Massachusetts Institute of Technology.

E. H. Williamson, superintendent of production and transmission for Peoples Natural Gas Co., has been named assistant to the vice president of operations. Williamson joined the company in 1932.

D. Hugh Jenks, Jr., Ashland Oil & Refining Co., has been elected chairman of the board of the Asphalt Institute. He succeeds **Robert O. Wilson,** Cosden Petroleum Corp. **J. J. Tumpeer,** Witco Chemical Co., has been named to succeed **G. R. Christie,** Socony Mobil Oil Co., as treasurer.

J. Walter Johnson, Sohio Petroleum Co.'s staff geologist in Billings, Mont., has been transferred to Oklahoma City as division geologist. Johnson has been with Sohio since 1944.

H. H. Elliston, retired staff engineer for Sinclair Oil & Gas Co., has joined Production Engineering & Equipment Co. as manager of the salt-water disposal and water-flooding division. He will headquarter in Tulsa.

Don Walker, formerly with Warren Petroleum Corp. in Denver, has joined Ashland Oil & Refining Co. as district geologist in the company's new Denver office.

W. R. O'Brien has been promoted from staff geologist at Midland, Tex., to division geophysicist at Dallas by Standard Oil Co. of Texas. At the same time, the company promoted **R. H. Shepard** from geophysical supervisor at the Midland division office to division staff geologist at Dallas.

Ray McGothlin, Sr., has been elected president of Texas Calgary Co., Abilene. McGothlin, formerly executive vice president, succeeds **John V. Boyce,** who resigned due to ill health.

Martin C. Kelsey, president of Rayflex Exploration Co., Dallas, has been elected 1958 president of the Dallas

Personals

Geophysical Society, succeeding **Robert E. Rettger,** Sun Oil Co. Other new officers include: **John A. Cathey,** Seaboard Oil Co., and **William C. Woolley,** Magnolia Petroleum Co., vice presidents; and **Mark J. Smith, Jr.,** Geophysical Service, Inc., secretary-treasurer.

R. A. House, formerly division regional geologist at Fort Worth for Gulf Oil Corp., has been transferred to British Honduras and named chief geologist for Gulf's operations there. House joined Gulf in 1947 and has been in the Fort Worth production division office for 8 years.

Dr. Wilson B. Emery, vice president of the petroleum division of American National Bank, Denver, has been elected a director of the bank. Emery was vice president, production manager, and a director of Ohio Oil Co. before joining American National.

STUART P. KING

Stuart P. King, general manager and a director of Merrill Petroleums, Ltd., Calgary, has joined Tennessee Gas Transmission Co. as manager of the company's new overseas department. TGT has an interest in Venezuelan and Bolivian concessions. Also assigned to the overseas department are **Marshall Jeffers,** senior petroleum engineer, who has been named manager of production, and **J. M. Browning,** district exploration manager in Calgary, now manager of overseas exploration. **Edwin Ross,** Houston district production superintendent, has been appointed assistant manager of production. **Dr. H. J. Harrington,** geological consultant in South America, has joined TGT as senior geologist. **Wilfred B. Tapper,** former vice president of Halliburton Oil Well Cementing Co., has been named general manager of operations for Chaco Petroleum, S.A., TGT subsidiary operating in Bolivia. He will headquarter in Cochabamba. **Jack W. Morris,** who has had more than 20 years' drilling and production experience in South America and the Near East, has been named production and drilling superintendent of Chaco. He was formerly Denver district exploration manager. Venezuelan activities of Tennessee Gas are handled through another subsidiary, Tennessee-Venezuela, S.A.

Personals

R. B. Bennett and **E. J. Hoffman** have been promoted to research specialists in the research and development division at Humble Oil & Refining Co.'s Baytown, Tex., refinery. Bennett will specialize in new product development. Hoffman, formerly section head in research on fuels processes in the company's executive development program, will specialize in long-range planning and evaluation of research. Both are graduates of the University of Texas.

R. B. BENNETT

E. J. HOFFMAN

R. D. JaQuay, technologist at Shell Oil Co.'s Wood River, Ill., refinery, has been transferred to Houston as research engineer. **D. W. Miller,** group leader at Wood River, has also transferred to Houston as group leader in the lab. **H. Voetter** transfers from the Amsterdam laboratories of Royal Dutch-Shell to Houston as senior research chemist on temporary assignment.

Hari K. Pargal, formerly with Caltex Refining (India), Ltd., has joined Imperial Chemical Industries (India) in Calcutta.

Ellis D. Gordon, Albuquerque, N. M., has been appointed Wyoming district geologist for U. S. Geological Survey. He succeeds **H. E. Babcock,** recently transferred to USGS offices in Washington, D. C.

Elard L. Haden has joined Continental Oil Co in Ponca City, Okla., as research engineer in the production research division.

John G. Storey, intermediate process engineer with Pan American Petroleum Corp. in Tulsa, has been transferred to Calgary as gas engineer.

M. W. Tamele, associate director of research at Shell Development Co.'s Emeryville, Calif., research center before his assignment to Shell research labs in Amsterdam several months ago, has been reassigned to Emeryville.

Dr. James E. Seebold has been named director of development in the research department of Standard Oil Co. (Ind.). **Dr. Arthur P. Lien** has been named director of petroleum research, and **Dr. Nathan Fragen** becomes director of chemical research. The three divide the responsibilities of **Dr. T. H. Rogers,** director of research, who will retire January 3. **Dr. Philip C. White** continues as manager of research for the company. In other appointments, **Dr. Earnest W. Thiele** and **Bernard H. Shoemaker** have been named research coordinators. **Dr. E. W. Adams** takes over as administrative director of the Whiting, Ind., laboratories. **Carl E. Johnson,** chemicals research, and **Henry Marchman,** chemicals development, have been promoted to division directors. Rogers, retiring director of research, has been with the company since 1922. He was assistant director and associate director of research before becoming director in 1947. At that time he was honored by the Chicago section of American Chemical Society as one of the 10 leading chemists in the petroleum field.

J. B. Avant, formerly geologist with **J. D. Wrather, Jr.,** has joined **W. H. Hudson,** Dallas independent.

Richard E. DuVall, has been promoted by Peoples Natural Gas Co. from superintendent of distribution to general superintendent of the company. DuVall joined Peoples Gas in 1936 after graduation from the University of Delaware. He had been chief civil engineer and assistant superintendent of distribution before his appointment as superintendent of distribution.

Fred C. Gross has been named junior chemist at Gulf Oil Corp.'s Philadelphia refinery technology laboratory.

David C. Benedict, supervising engineer for Atlantic Refining Co. in Philadelphia, has joined Arthur D. Little, Inc., in Cambridge, Mass., as senior staff associate.

John A. Mills, The Texas Co., Midland, Tex., has been elected president of the Permian Basin Crude Oil Representatives Association, succeeding **J. C. Hart** of Shell Oil Co. New vice president is **Dicke Booker,** Cities Service Oil Co., Odessa. Other new officers are **Clyde L. Emmons,** Gulf Oil Corp., Midland, secretary-editor; **Howard Jetton,** Atlantic Refining Co., Midland, treasurer; **R. L. Denton,** Magnolia Petroleum Co., Midland, director representative to the National Oil Scouts Association; and **W. D. Kleine,** Permian Oil Co., alternate director representative.

Gordon R. MacPherson, supervising resident engineer in process planning for California Research Corp. in Richmond, Calif., has been promoted to process planning division supervisor.

Warren L. Shafer, petroleum engineer for Skiles Oil Corp. in Mount Carmel, Ill., has joined Calvert Drilling Co. in Olney, Ill., in the same capacity.

Roy L. Essary, exploitation engineer, has been transferred to Roswell, N. M., from Hobbs, N. M., by Shell Oil Co.

David J. Brennan, geologist, has been transferred to Oklahoma City from Billings, Mont., by Shell Oil Co.

Reese H. Taylor, chairman of the board, Union Oil Co. of California, is one of 60 business executives appointed to the World Trade Advisory Committee by Secretary of Commerce Sinclair Weeks. The committee will advise the Government on trade and investment policies.

Milton H. Kuhleman, formerly Billings, Mont., district manager for Ashland Oil & Refining Co., has opened consulting offices in Billings.

DEATHS

Robert F. Lane, Houston manager for McCullough Tool Co., died December 12 in Houston after a long illness.

James L. Noland, 78, retired drilling contractor, died December 16 in Tulsa after a long illness. Noland was active in Texas, Oklahoma, and Kansas before retiring in 1940.

Keating L. Simons, 79, retired vice president and Houston division manager for United Gas Corp., died December 15 in Columbia, S. C. Simons retired in 1946. He had been with the old El Paso Gas Co. and Houston Gas & Fuel Co., before joining United Gas Corp.

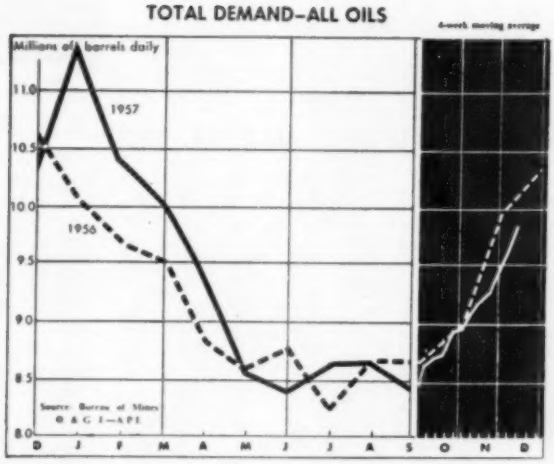
James M. West, 54, Houston oil man, died in a hospital there December 18 after a long illness. He was president of West Production Co. Nicknamed "Silver Dollar Jim West," he was widely known in Houston as a volunteer policeman.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,866,750	UP	17,775	DOWN	496,278
Crude stocks	279,751,000	UP	26,000	UP	6,134,000
Completions	905	DOWN	1	DOWN	336
Refinery runs	7,774,000	DOWN	33,000	DOWN	226,000
Gasoline stocks	188,845,000	UP	758,000	UP	11,808,000
Kerosine stocks	29,904,000	DOWN	1,379,000	DOWN	2,514,000
Distillate stocks	159,275,000	DOWN	3,870,000	UP	19,665,000
Residual stocks	59,034,000	UP	195,000	UP	15,889,000
Four-product stocks	437,058,000	DOWN	4,296,000	UP	44,848,000
Total imports	1,359,700	DOWN	203,500	UP	133,200

TOTAL DEMAND—ALL OILS



Both Domestic and Export Demands Have Been Down in Recent Months

TOTAL DEMAND for all petroleum products has been running behind last year for several months. The chart on this page shows that total demand for September was well under the total for September 1956. The October figures for both years were about the same, but demand lagged again in November.

These facts have been apparent from current weekly figures, but in most cases the loss has been charged against the big drop in exports this year. Total exports averaged 496,300 bbl. daily for the September-October-November period last year, compared with 354,000 bbl. daily for the same months of 1955. And, the real gain started in November 1956.

The period of abnormal exports continued through April this year. The average for April was 809,000 bbl. daily compared with normal of about 325,000 bbl. daily. For the 6-month period from November through April, exports averaged about 465,000 bbl. daily above normal.

This means that domestic demand this winter would have to increase at least 465,000 bbl. daily over last winter for total demand to break even.

There is no chance that domestic demand will show a gain of that order this winter. In fact, domestic demand for the 3-month period, September through November, was less than a year earlier by about 65,000 bbl. daily.

Domestic gasoline demand for the period was about the same as last year. Kerosine was off better than 25,000 bbl. daily. Distillate demand was up about 26,000 bbl. daily, but residual dropped by at least 120,000 bbl. daily. The total for other products was up about 50,000 bbl. daily.

Gasoline demand has been disappointing this year. Table 1 shows a very small gain in September and decreases for October and November. Table 2 shows only one good stock-reduction month this year. That was July. By the end of the year, gasoline stocks will be up 10,000,000 bbl. from last year. Unless corrected, the high stock level will influence late winter prices.

TABLE 1—TOTAL GASOLINE DEMAND

(Thousands of barrels daily)

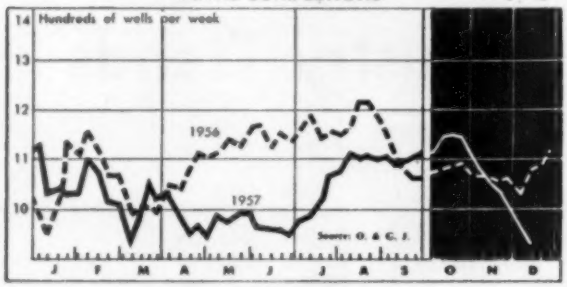
	1957	1956	1955	1954	1953
January	3,655	3,331	3,228	2,965	2,945
February	3,597	3,437	3,278	3,160	3,138
March	3,783	3,715	3,519	3,310	3,219
April	3,955	3,859	3,818	3,532	3,473
May	4,114	4,075	3,868	3,444	3,454
June	4,156	4,308	4,145	3,877	3,842
July	4,286	4,000	3,880	3,702	3,690
August	4,262	4,155	4,033	3,629	3,541
September	3,897	3,823	3,911	3,560	3,576
October	3,870	3,940	3,779	3,489	3,421
November	3,770	3,848	3,765	3,476	3,334
December		3,638	3,718	3,434	3,249

TABLE 2—CHANGE IN GASOLINE STOCKS BY MONTHS

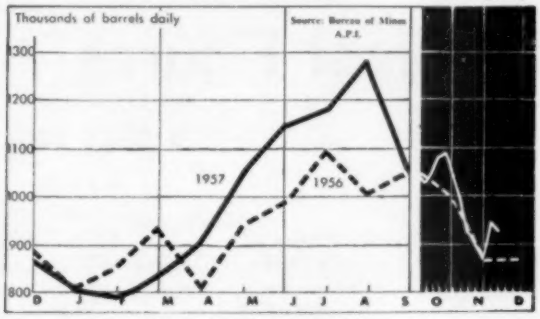
(Thousands of barrels)

	1957	1956	1955	1954	1953
January	10,431	18,472	14,162	13,832	14,560
February	7,568	12,187	12,081	8,246	7,362
March	1,446	3,606	2,329	1,347	4,687
April	—5,309	—6,399	—8,371	—4,291	—4,522
May	—6,313	—6,626	—6,850	600	—2,034
June	—5,031	—9,597	—11,312	—12,202	—9,908
July	—12,195	—540	—360	—7,394	—2,814
August	—3,837	—3,597	—5,167	—4,842	2,170
September	6,657	5,035	—1,718	—2,252	—2,336
October	700	—5,176	2,909	—1,255	517
November	4,600	2,010	4,768	943	6,170
December		12,463	7,562	4,796	9,283
Year-end stocks		187,271	165,433	155,400	157,872

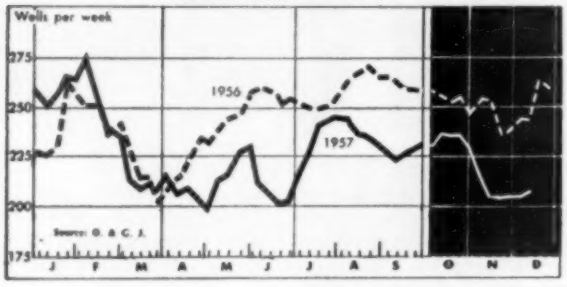
TOTAL COMPLETIONS



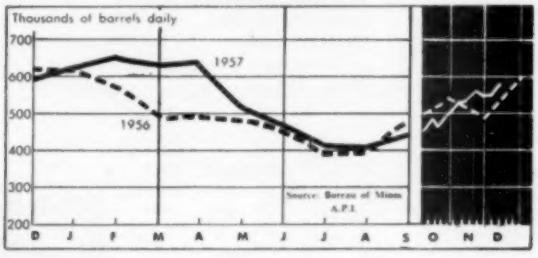
CRUDE IMPORTS



WILDCAT COMPLETIONS



PRODUCT IMPORTS

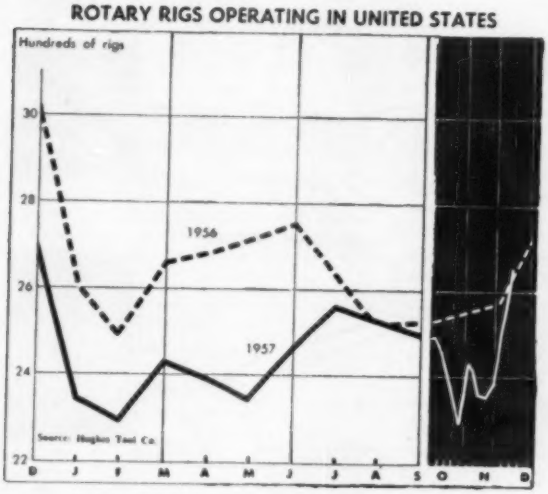


WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 14, 1957

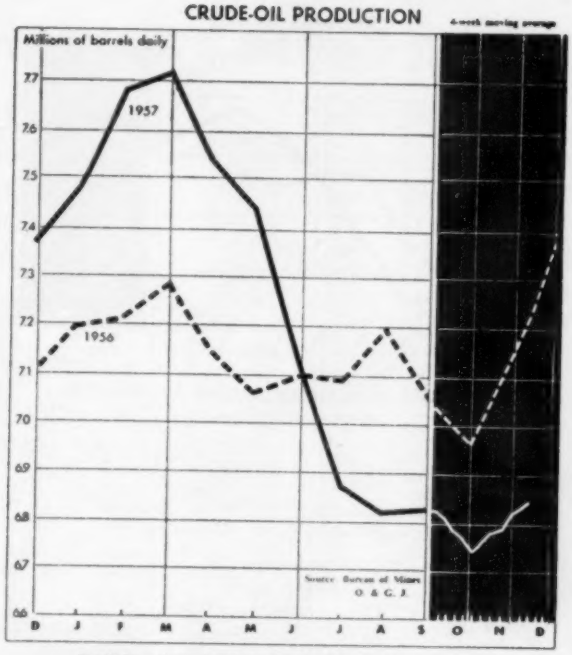
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	1	1	0	0	0	0	11,510	75	‡107	0	0	0	0	0	26	‡50
Arkansas	25	13	0	0	12	0	78,567	1,059	944	6	1	0	0	5	198	178
California	52	31	0	1	20	0	222,073	2,146	2,143	13	0	0	0	13	507	497
Colorado	21	5	0	2	14	0	102,592	821	1,173	12	1	0	0	11	530	645
Illinois	54	28	0	3	23	0	105,855	2,584	3,664	7	0	0	0	7	608	743
Indiana	0	0	0	0	0	0	0	653	689	0	0	0	0	0	123	136
Kansas	55	17	0	4	33	1	195,443	4,025	4,750	19	2	0	0	17	793	1,033
Kentucky	14	1	0	12	1	0	44,288	1,444	1,857	1	1	0	0	0	300	424
Louisiana	60	26	6	6	22	0	526,741	3,686	3,658	10	0	0	2	8	649	736
North	18	10	0	1	7	0	56,431	1,374	1,617	3	0	0	0	3	195	251
South	28	11	6	0	11	0	318,902	1,663	1,638	3	0	0	0	3	366	408
Offshore	14	5	0	5	4	0	151,408	649	403	4	0	0	2	2	88	77
Michigan	10	5	0	1	4	0	31,871	423	421	4	0	0	1	3	146	162
Mississippi	5	1	0	0	4	0	44,745	370	422	1	0	0	0	1	189	209
Montana	4	2	0	0	2	0	23,622	419	471	3	1	0	0	2	177	181
Nebraska	16	7	0	0	9	0	97,074	852	882	8	2	0	0	6	463	435
New Mexico	43	14	1	16	12	0	215,893	2,036	1,840	6	0	0	0	6	256	269
Northwest	21	3	0	14	4	0	95,815	870	818	1	0	0	0	1	97	103
Southeast	22	11	1	2	8	0	120,078	166	1,022	5	0	0	0	5	159	166
New York	9	4	0	0	0	5	9,250	449	.....	0	0	0	0	0	11	.....
North Dakota	4	1	0	0	3	0	15,986	285	254	3	0	0	0	3	129	75
Ohio	29	19	0	2	8	0	65,369	1,087	1,040	0	0	0	0	0	18	13
Oklahoma	103	60	0	3	40	0	347,063	5,982	7,804	16	0	0	0	16	713	828
Pennsylvania	0	0	0	0	0	0	0	571	†1,229	0	0	0	0	0	41	†36
Texas	348	168	13	18	142	7	1,539,055	20,439	20,670	76	6	2	1	67	4,798	5,368
Dist. 1	20	6	0	0	14	0	52,803	1,188	*2,966	11	0	0	0	11	412	*1,054
Dist. 2	12	0	2	6	4	0	62,728	737	*2,527	3	0	0	0	3	247	*835
Dist. 3	25	11	4	2	8	0	172,013	1,569	.....	8	0	2	0	6	431	.....
Dist. 4	50	7	5	3	34	1	200,107	1,364	.....	9	0	0	0	9	427	.....
East	32	20	1	0	11	0	138,783	1,299	1,092	9	1	0	0	8	364	410
Dist. 7-B	42	22	0	1	17	2	128,349	2,779	.....	6	2	0	0	4	935	.....
West	97	72	0	1	24	0	511,691	5,800	5,481	18	1	0	1	16	825	863
Dist. 9	57	24	0	2	27	4	204,070	4,375	*7,337	10	2	0	0	8	1,049	*2,084
Dist. 10	13	6	1	3	3	0	68,511	1,328	1,267	2	0	0	0	2	108	122
Utah	20	17	0	0	3	0	110,389	254	138	3	1	0	0	2	122	75
West Virginia	10	0	0	7	3	0	25,845	666	665	1	0	0	1	0	32	26
Wyoming	17	7	0	2	8	0	73,304	827	872	8	1	0	0	7	291	264
Misc. (Tenn., S. D.)	5	0	0	2	3	0	7,408	130	73	5	0	0	2	3	112	65
Total U. S.	**905**	427	20	79	366	13	3,893,945	51,283	55,766	**202**	16	2	7	177	11,232	12,448
Total prev. week	906	433	16	51	390	16	3,743,834	.....	.....	210	13	1	9	187	.....	.....
Cum. 1957	51,283	26,319	604	3,688	19,642	1,030	212,533,924	.....	.....	11,232	1,119	101	377	9,635	.....	.....
Western Canada	(Not available)						.....	2,810	3,125	0	0	0	0	0	804	.....

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. †Incl. New York. ‡Incl. Florida and Georgia.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL PRODUCTION



ACTIVE ROTARY RIGS*

Area—	12-16-57	12-9-57	12-2-57	12-17-56
Alabama	9	9	6	9
Arkansas	26	29	28	23
Arizona	1	1	1	
California	100	97	98	111
Colorado	42	47	44	68
Florida	1	2	2	2
Georgia				
Idaho				
Illinois	52	57	54	82
Indiana	11	5	8	16
Iowa	2	2	2	1
Kansas	177	162	152	190
Kentucky	15	10	9	11
Louisiana	384	381	370	501
North	40	46	41	79
South	264	256	250	322
Offshore	80	79	79	100
Maryland	1	1	1	
Michigan	12	12	11	16
Missouri				
Montana	33	33	34	34
Mississippi	44	50	37	31
Nebraska	37	32	25	29
Nevada				2
New Mexico	167	153	158	151
New York	1	1	1	
North Dakota	50	48	46	28
Ohio	1	1	1	
Oklahoma	270	257	265	298
Oregon				
Pennsylvania	9	9	9	8
South Dakota	1	2	2	2
Texas	1,073	997	903	1,183
Gulf Coast	227	215	174	282
Offshore	6	5	5	8
West	405	371	352	415
North	365	349	327	401
East	70	57	45	77
Tennessee				
Utah	56	56	56	30
Washington	1	1	1	1
West Virginia	2	4	4	2
Wyoming	74	67	65	65
Virginia				
Total United States	2,652	2,526	2,393	2,894
Western Canada	188	180	175	238
Eastern Canada	2	2	2	
Grand total	2,842	2,708	2,570	3,132

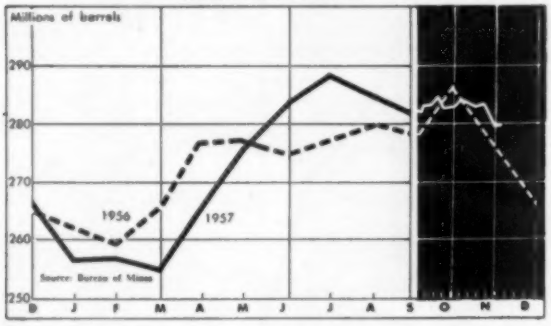
*Hughes Tool Co.

DAILY AVERAGE PRODUCTION FOR WEEK

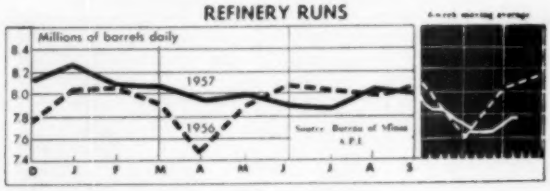
	December 14, 1957			Dec. 7
	Crude oil	Lease condensate	Total	total
Alabama	15,700		15,700	15,600
Arkansas	82,575	225	82,800	82,625
California	928,400		928,400	927,800
Coloroado	139,900		139,900	141,100
Eastern	52,300		52,300	52,600
Florida	1,275		1,275	1,325
Illinois	233,400		233,400	235,400
Indiana	30,500		30,500	31,100
Kansas	†345,550		†345,550	†326,200
Kentucky	42,800		42,800	42,900
Louisiana	752,350	80,500	832,850	832,800
North	110,350	2,500	112,850	112,800
South	642,000	78,000	720,000	720,000
Michigan	27,700		27,700	26,000
Mississippi	99,600	4,275	103,875	103,875
Montana	75,750		75,750	75,350
Nebraska	55,600		55,600	55,400
Nevada	100		100	100
New Mexico	256,600	5,500	262,100	262,100
North Dakota	28,650		28,650	39,500
Oklahoma	†574,200		†574,200	†571,400
Texas	2,657,000	58,400	2,715,400	2,715,400
Dist. 1	50,000	550	50,550	50,550
Dist. 2	121,000	9,300	130,300	130,300
Dist. 3	378,000	28,000	406,000	406,000
Dist. 4	197,000	6,400	203,400	203,400
Dist. 5	31,000	450	31,450	31,450
Dist. 6	109,000	6,400	115,400	115,400
East Texas Field	160,000		160,000	160,000
Dist. 7-B	144,000	125	144,125	144,125
Dist. 7-C	151,000	4,075	155,075	155,075
Dist. 8	1,007,000	1,800	1,008,800	1,008,800
Dist. 9	206,000	700	206,700	206,700
Dist. 10	103,000	600	103,600	103,600
Utah	13,050		13,050	13,800
Wyoming	304,700		304,700	296,450
Others	‡150		‡150	‡150
Total U. S.	6,717,850	148,900	6,866,750	6,848,975
Change from prev. week, up			17,775	
Canada	†398,900		†398,900	†409,960
Total U. S. production—Jan. 1-Dec. 4				2,494,518,860 bbl.
Same period last year (crude plus cond.)				*2,492,117,073 bbl.

*Includes 43,314,245 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

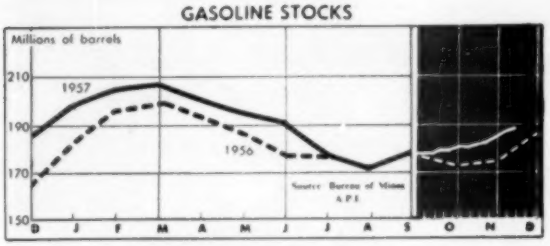
CRUDE-OIL STOCKS



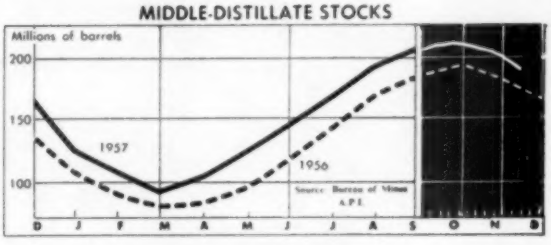
REFINERY RUNS



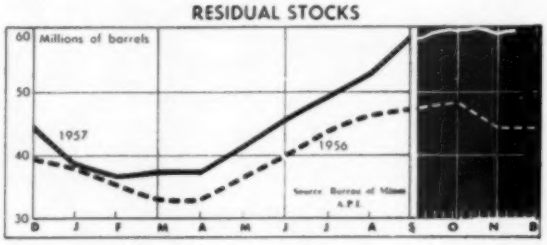
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	12-7-57	12-30-57	12-8-56
Pennsylvania Grade	3,039	3,154	2,349
Other Appalachian	1,789	1,780	2,266
Illinois, Indiana, and Michigan	11,131	10,488	11,750
Nebraska and North Dakota	2,986	3,103	2,293
Kansas	10,647	10,668	10,647
Oklahoma	20,874	20,519	23,441
Arkansas	2,910	2,739	2,905
Louisiana	19,868	20,075	18,771
North	3,061	3,309	2,456
South	16,807	16,766	16,315
Mississippi, Ala., and Fla.	2,735	2,804	3,066
New Mexico	9,537	9,501	7,618
Texas	123,505	124,576	122,560
East Texas	8,891	9,154	8,800
West Texas	55,096	54,785	58,957
Texas Gulf	25,745	25,868	23,256
Other Texas	33,773	34,769	31,547
Wyoming	13,309	13,672	16,631
Other Rocky Mountain	6,622	7,043	6,322
California	33,772	33,663	28,597
Foreign	†17,027	15,940	14,401
Total	279,751	279,725	273,617

*Bureau of Mines. †Includes 5,918,000 bbl. in California.

A.P.I. REFINERY REPORT—DECEMBER 13, 1957

(Thousands of barrels)

										Bureau of Mines, December 1956				
	Daily	Daily average production				Stocks‡				Daily	Daily average production			
District—	avg. runs	Gaso.*	Kero.	Dist.	Resid.	Gaso.†	Kero.	Dist.	Resid.	avg. runs	Gaso.*	Kero.	Dist.	Resid.
East Coast	1,203	470.3	34.7	356.6	176.7	44,304	12,849	62,808	13,071	1,200	500.1	50.3	329.4	234.3
Appalachian:														
District 1	109	45.1	6.3	23.6	10.6	4,868	609	3,146	663	103	40.2	5.6	25.5	9.1
District 2	106	54.4	9.1	19.7	18.4	2,594	457	1,299	373	108	55.9	6.6	23.4	16.2
Ind., Ill., Ky.	1,376	720.7	68.2	306.4	177.3	32,233	6,154	21,562	5,490	1,481	762.5	82.6	327.3	224.0
Minn., Wis., Dak.	108	53.6	8.3	22.7	11.6	7,007	1,333	7,180	348	97	48.7	4.8	26.3	10.9
Okla., Kans., Mo.	717	404.8	9.6	191.7	45.6	15,363	1,408	12,500	1,257	694	398.3	12.0	194.1	41.4
Inland Texas	254	193.9	9.7	45.9	21.1	7,261	462	2,134	2,108	279	201.8	10.6	53.0	28.0
Texas Gulf Coast	1,783	913.7	114.3	493.3	201.7	25,543	3,215	18,265	7,036	1,949	902.0	120.1	533.0	263.5
La. Gulf Coast	613	352.9	26.2	187.8	53.6	11,468	1,637	8,654	1,210	679	368.8	64.3	190.7	56.2
N La. and Ark.	100	41.3	7.4	22.0	7.3	4,159	1,050	1,993	232	103	42.7	9.9	22.2	6.9
Rocky Mountain:														
New Mexico	28	15.4	0.1	5.6	3.9	427	12	95	75	27	13.9	.4	5.0	3.3
Other Rocky Mt.	269	126.0	2.6	69.4	34.8	5,847	330	2,815	940	267	136.0	6.4	63.4	37.7
West Coast	1,108	513.0	13.1	129.3	346.1	27,771	388	16,824	26,231	1,254	514.8	4.9	187.8	356.3
Dec. 13, 1957	7,774	3,905.1	309.6	1,874.0	1,108.7	188,845	29,904	159,275	59,034	8,141	3,985.7	378.5	1,981.1	1,287.8
Dec. 6, 1957	7,807	3,952.9	349.6	1,842.3	1,084.6	188,087	31,283	163,145	58,839					
Dec. 14, 1956	8,000	3,866.6	345.4	1,943.1	1,194.3	177,037	32,418	139,610	43,145					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (89 octane)	11.50-11.75
Premium (98 octane)	14.25-14.50

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	10.50-11.00
Regular (92 octane)	10.75-11.25
Premium (97 octane)	12.25-12.75
Premium (98 octane)	12.50-13.00

California (rack) (Los Angeles):

Regular (88 octane)	12.2
Premium (96 octane)	14.8
Premium (98 octane)	15.0

Caribbean area (cargoes):

Regular (87 octane)	10.625
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4.5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

★ Kerosine 42-44	9.875-10.25
★ Diesel oil (58 d.i. and above)	9.50-10.00
★ Distillate No. 1	9.50-10.00
★ Distillate No. 2	8.875-9.25

Gulf Coast (cargoes):

Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50

New York Harbor (barges):

Kerosine 41-43	10.75
Distillate No. 2	10.25
Diesel fuel, 48-52 d.i.	10.55

Caribbean area (cargoes):

Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank cars	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3): Residual fuel (max. 1% S)	$1.60-1.80
Gulf Coast (cargoes): Bunker C fuel	$2.50-2.75
New York Harbor (barges): Bunker C fuel	$2.95
Caribbean (cargoes): Bunker C	$2.55
California (rack): Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3): 150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade: 145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) (§)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Most buyers are posting Wyoming sour in two schedules, 15°-26.9° and 27°-40°.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
Illinois Basin	3.00-3.15
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.59
Iraq, 36.0°-36.9°, Tripoli, Banias	2.59
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—22.5%)	$2.21
★ Gulf-U.S.N.H., dirty (USMC—27.5%)	2.07
Carib.-N.S.N.H., dirty (USMC—52.5%)	1.28
★ P.G.-San Francisco, dirty (USMC—70%)	4.89
★ P.G.-U.S.N.H., dirty (USMC—70%)	3.81

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Box K-457, The Oil and Gas Journal, Tulsa, Oklahoma.

Mineral-Rights Ruling Upheld

A DISTRICT COURT at Greeley, Colo., has upheld the authority of the Weld County commissioners to reserve the mineral rights when selling land acquired through failure to pay taxes.

Judge Dale E. Shannon rejected a claim by Frank Farnik of Fort Morgan, Colo., to mineral rights on a half section of land he bought at a tax sale in 1943.

Amerada Petroleum Co.'s 1 Weld County well, which began producing in 1955, is located on the tract of land in northern Colorado. The judge ruled that the county, not Farnik, is entitled to $32,233 in accrued royalties from the well.

Refining Unit Sets Record

STANDARD OIL CO. (Ind.) has just completed turnaround on a fluid catalytic cracker which was on stream 905 days without overhaul.

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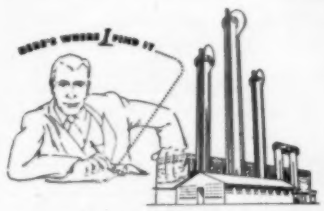
The turnaround at the company's Casper, Wyo., plant involved the 8,000-bbl. cat cracker, vapor-recovery unit, and alkylation unit. Indiana Standard said it completed the job with the least cost-per-barrel and least number of man hours expended by any refinery on a similar project.



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A

Anchor Petroleum Company 26
Armco Drainage & Metal Products, Inc. 22

B

Baker Oil Tools, Inc. 24
Bethlehem Steel Co. 10
Brown Oil Tools, Inc. 7
Byron Jackson Tools, Inc. 52

C

Cabot Shops, Inc. 14
Classified Advertising 128, 129, 130
Coates Field Service, Inc. 95
Continental-Emsco Company 19
Crane Co. 30
Crose Manufacturing Co., Inc., M. J. 94

D

Dow Chemical Company, The 90
Dowell Incorporated 1
Drilling & Service, Inc. 100

F

Fisher Governor Company 16, 17
Fleet-Line Co. 95
Flint Steel Corporation 80

G

Gaso Pump & Burner Mfg. Co. 44
Goodyear Tire & Rubber Company, The 11
Grancell, I. H. 97
Guiberson Corporation 49

H

Halliburton Oil Well Cementing Co. 8, 9
Hercules Tool Company 95
Houdry Process Corporation 79
Huey & Co., S. E. 94
Hughes Tool Co. ..... Back Cover

I

Inferno Co., The 97

J

Johnston Testers Subsidiary of Schlumberger Well Surveying Corporation 21
Jones & Laughlin Supply Division 115

K

Kelley Company, Ben F. 73
Kinzbach Tool Co., Inc. 98

M

Macwhyte Co. 5
Mission Mfg. Company 88, 89

N

National Aluminate Corp. 37
National Tank Company 132
Norris Manufacturer, Inc., W. C. 4

O

Oil Well Supply Division 6
Otis Engineering Corporation 15

P

Parkersburg Rig & Reel Co. 41
Payne Manufacturing Company, Inc. 96

R

Rockwood Sprinkler Company 87

S

Sikorsky Aircraft 105
Standard Oil Company (New Jersey) ... 116

U

United States Steel Corporation—
Oil Well Supply Division 8

W

Well Equipment Mfg. Corp. 20
Wilson Supply Company 12, 13
Wyatt's Plastics, Inc. .... Inside Front Cover

Y

Youngstown Sheet and Tube Company
Inside Back Cover

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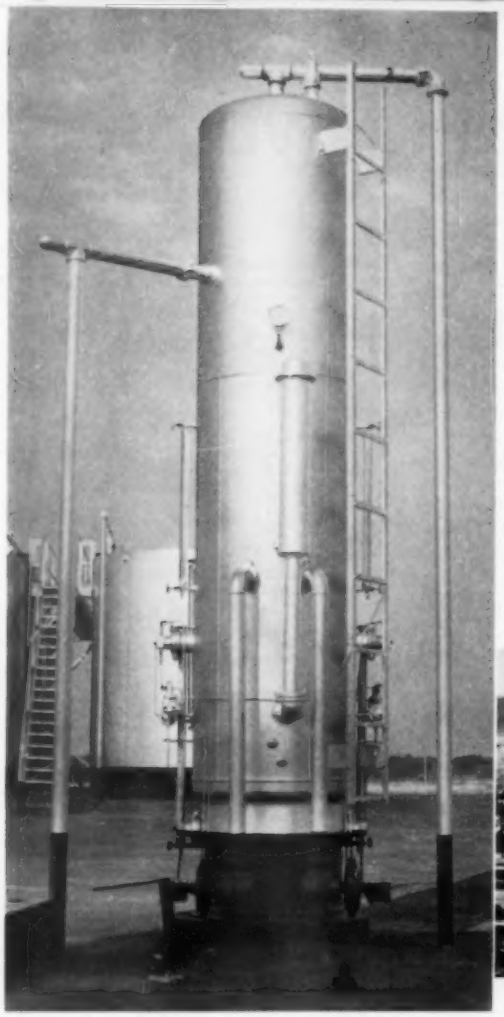

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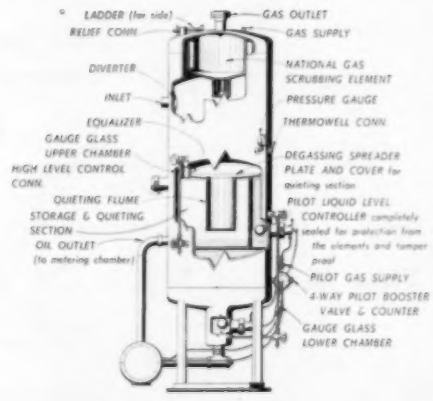

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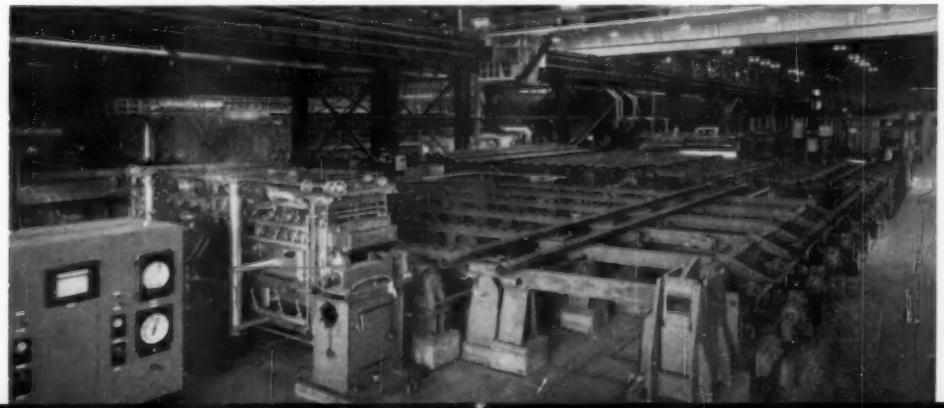

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